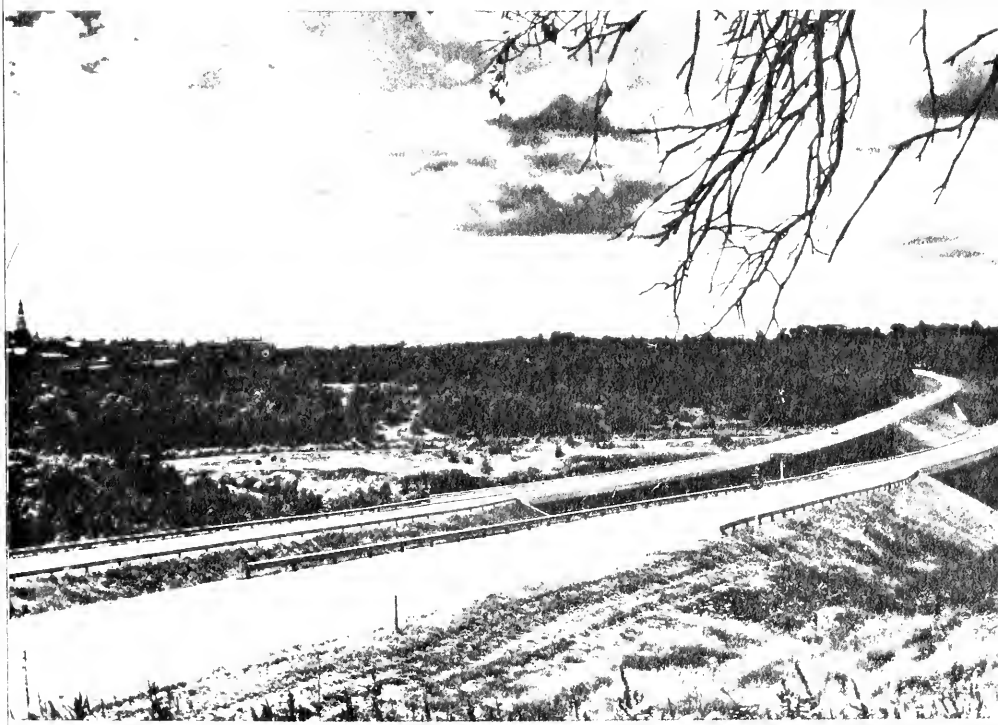
1962

Annual Report of the Bureau of Public Roads Fiscal Year 1962



Interstate Route 95 in Maine crosses Messalonskee Stream on twin bridges in Waterville, as it sweeps past Colby College

DEPARTMENT OF COMMERCE
UNITED STATES OF AMERICA

Annual Report of the

Bureau of Public Roads

Fiscal Year 1962

HIGHWAY PROGRESS 1962

UNITED STATES DEPARTMENT OF COMMERCE

November 1962

U.S. DEPARTMENT OF COMMERCE

LUTHER H. HODGES, *Secretary*

BUREAU OF PUBLIC ROADS

REX M. WHITTON, *Administrator*

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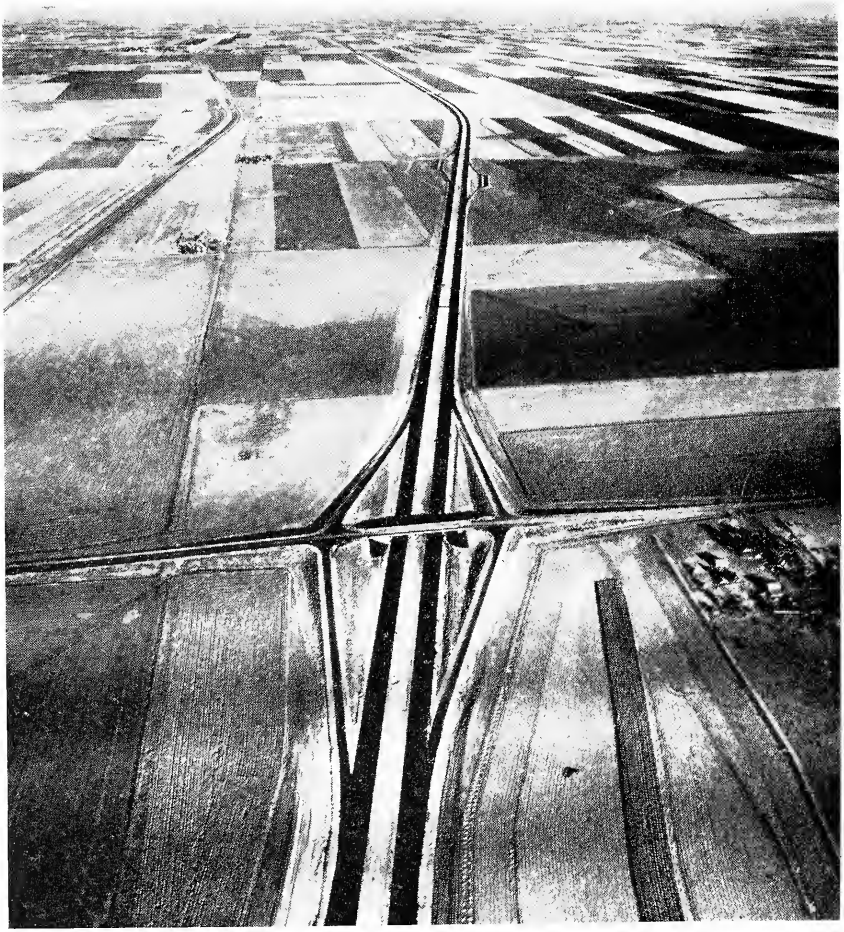


Forty-four miles of Interstate Route 70 are in use in western Kansas, crossing the high-plains wheat country. Kansas Route 23E crosses to Grainfield in the foreground. In the middle distance twin safety rest areas flank I–70. (Photograph taken before completion of construction.)

HIGHWAY PROGRESS, 1962

ANNUAL REPORT OF THE BUREAU OF PUBLIC ROADS

Summary Review of the Fiscal Year

THE FISCAL YEAR 1962 (July 1, 1961–June 30, 1962) saw continued progress in the vast nationwide highway improvement program launched by the Federal-Aid Highway Act of 1956 and importantly bolstered by the Federal-Aid Highway Act of 1961. Accomplishments under the Federal-aid program were good in fiscal year 1962, maintaining about the same level as that attained in 1961.

Federal-aid funds obligated during fiscal year 1962 for surveys and plans, right-of-way acquisition, and construction totaled $3.034 billion.

Progress on the 41,000-mile Interstate System continued to be the center of public interest. During the year 1,725 miles of the system were opened to traffic. At the end of the year 12,550 miles were in use, of which 7,225 miles were completed to standards needed for fully serving traffic in 1975. In addition, 4,801 miles were under construction. Motorists and truckers across the Nation were experiencing the great advantages of these controlled-access freeways. Industrial, commercial, and residential development was being attracted to locations adjacent to the Interstate right-of-way.

Improvements were completed during the year on 18,375 miles of main highways, arterial streets, and secondary roads included in the Federal-aid primary and secondary systems and their urban extensions (excluding the Interstate System improvements). This so-called Federal-aid ABC program had its modest beginning in 1917.

Highway use

Highway use continued to break past records. Motor-vehicle registrations totaled 75.8 million in calendar year 1961 and were expected to reach 78.6 million in 1962, an increase of 3.7 percent. Travel on all roads and streets was estimated at 737.5 billion vehicle-miles in 1961 and was forecast to reach 767 billion in 1962, a gain of 4.1 percent.

Total mileage of all roads and streets in the United States, 3.6 million miles, was no longer growing extensively, but great strides were being made in improving their quality, capacity, and safety.

Total expenditures by all levels of government on all roads and streets—for capital outlay, maintenance, highway police, administration, and interest on highway debt—were estimated at $11.2 billion in the calendar year 1961 and were expected to total $12.0 billion in 1962. Capital outlay alone—for engineering, right-of-way, and construction—was estimated at $6.7 billion in calendar year 1961 and $7.3 billion in 1962. Of these improvement outlays, construction accounted for $5.1 billion in 1961 and $5.6 billion in 1962.

Accomplishments of the year

During fiscal year 1962, projects were programed in the Federal-aid and Federal highway programs for the construction of 24,259 miles of improvements. Contracts were awarded during the year for improvements to 24,566 miles of roads and streets. Construction put in place during the year involved $2.864 billion of Federal funds.

Completions of all classes of Federal-aid and Federal projects during the fiscal year provided improvements on 23,211 miles of roads and streets. Included were 21,046 miles of highways and 5,768 bridges on the Federal-aid systems and 2,165 miles of roads in national forests, parks, and parkways and on flood-relief and access-road projects.

Hazards at railway-highway grade crossings were removed during the year by elimination of 431 grade crossings, reconstruction of 46 inadequate grade-separation structures, and protection of 380 crossings by installation of flashing lights or other safety devices. These figures include the separation or protection of crossings encountered on new highway locations.

The linear mileage of highway improvements completed is not a full measure of the facilities provided for traffic. Capacity and safety and riding quality are all improved by application of the knowledge gained by experience, observation, research, and development. More and more highways were constructed with better alinement, flatter curves and grades, and smoother and wider pavements. Not only the Interstate but many other Federal-aid projects completed during the year had access control, planned interchanges, and other freeway features.

Many of these projects were built four or more lanes wide, replacing old roads with only two lanes. The 21,046 miles of Federal-aid projects completed during the fiscal year 1962 included 3,724 miles of 4-lane highways and 300 miles having 6 lanes or more. Thus the year's Federal-aid project completions provided the equivalent of 50,739 miles of single-lane construction.

At the end of the fiscal year, construction was underway or plans had been approved, in the Federal-aid program, for improvements on 31,316 miles of roads and streets. Included were construction of 11,165 bridges and the elimination, reconstruction, or protection of 1,522 railway-highway crossings. The estimated cost of this work was $10.4 billion, of which $7.7 billion was Federal aid.

In addition, at the close of the year, the programs for construction of national forest, park, and public lands highways, defense-access roads, and flood-damaged roads and bridges included improvements underway on 3,211 miles, at a total estimated cost of $170 million including $160 million of Federal funds.

Accomplishments of the year on the several Federal-aid systems and in the Federal lands highway programs, and detailed information on other subjects, will be found in individual presentations in other sections of this report. Supporting statistics, both in summary and detail, appear in the appendix tables.

Federal-aid apportionments

Apportionment of the $3.325 billion of Federal-aid funds authorized for fiscal year 1963 was made to the States on August 17 and October 10, 1961. The total of Federal-aid funds apportioned since passage of the 1956 act, which launched the accelerated highway program, was thus brought to $19.7 billion.

The August 17 apportionment included all of the $2.4 billion authorized for the Interstate System for fiscal year 1963, and $693.75 million of the $925 million authorized for the Federal-aid primary and secondary systems and their urban extensions (the so-called ABC program). Because post road mileage (rural delivery and star routes) is one of the elements involved in apportioning ABC funds among the States, and June 30, 1961, figures were not available in time,

The Capital Avenue interchange on Interstate Route 45, adjacent to downtown Houston, Tex. (The viaduct at the left was not yet open to traffic.)

only 75 percent of the authorized ABC funds were apportioned on August 17. The remainder of the $925 million authorized was apportioned on October 10.

In apportioning the 1963 ABC funds, two adjustments related to apportionments of prior years were necessary. The 1962 apportionment had been made on the basis of supposedly final 1960 census data, but revised rural and urban population figures subsequently became available. Also, the 1957–61 apportionments were made on the basis of the post road mileage of the preceding year in each case, rather than the current year. Recalculations were therefore made of the 1957–62 apportionments, and the necessary adjustments were reflected in the 1963 apportionment of ABC funds.

Reports and legislation

During the year the Secretary of Commerce and the Housing and Home Finance Administrator prepared, at the request of the President, a joint report on urban transportation, concerned with both transit and private vehicle transportation. Public Roads had an active part in the preparation of this report. In turn, the report provided the basis for an important segment of the President's Transportation Message to Congress. Key proposals were for a requirement that highways in a metropolitan area be planned as an integral part of a balanced transportation system, consistent with development plans for the area; use of Federal-aid secondary funds in urban as well as in rural areas; assistance to families and businesses dislocated by the highway program; and expanded use of Federal aid for highway planning and research.

At the close of the year legislation was under consideration in the Congress relating to the President's recommendations, and for provision of Federal-aid authorizations for fiscal years 1964 and 1965 for the Federal-aid primary and

secondary systems and their urban extensions and for other roads on Federal lands.

At the request of the Senate Committee on Public Works, Public Roads prepared a comprehensive report on the use of materials for the Nation's highways.

Construction contracts and prices

The Federal-aid highway construction program is accomplished under the traditional American practice of competitive bidding for contracts let by the States. Competitive bidding during the fiscal year was generally quite spirited, averaging 5.9 bids per contract.

During the fiscal year, 6,259 Federal-aid construction contracts were awarded, of which 3,505 were on the primary system and 2,754 on the secondary system. These totals included 700 miscellaneous Federal-aid highway contracts covering such work as demolition of buildings, landscaping, and storm drainage. The primary system projects included 1,720 on the Interstate system, or 49 percent. Contracts for urban work were also included in the total for the primary system. Successful bidders on Federal-aid contracts averaged 2.1 contract awards each.

The average size contract during the year was $485,400, and 86.8 percent of the contracts were for less than $1 million.

The trend of stabilization in highway construction bid prices, which began in the second quarter of fiscal year 1957, continued throughout fiscal year 1962. The composite index for the first quarter of fiscal year 1957 was 100.8 (1957–59 average=100) which was 20 percent above the low point of 84.0 at the end of fiscal year 1955. The composite index for the fourth quarter of fiscal year 1961 was 93.2 which was 11 percent above the same low point. The index for the fourth quarter of 1962 was 97.0, resulting in a net increase of 4.0 percent during fiscal year 1962. The above figures are based on a recent revision of the weighting structure of the index and a change in the base period from 1925–29 to 1957–59, to reflect more accurately the bid price trend in present day highway construction.

During the fiscal year the costs of labor and materials amounted to 25 percent and 53 percent, respectively, of the total highway construction cost; the remaining 22 percent was accounted for by equipment ownership, overhead, and profit.

Average hourly earnings of labor on highway construction increased 7.5 percent during fiscal year 1962 but, as a result of continually improving productivity in highway construction, the cost of labor increased only 4.0 percent. The cost of highway construction materials dropped 1.0 percent, while equipment ownership costs did not change during the year. The weighted composite increase of highway construction, labor, materials, and equipment ownership costs was 0.5 percent.

Federal-aid highway construction during fiscal year 1962 utilized some 275 million man-hours of labor, 1.4 million tons of steel, 38 million barrels of cement, 4.3 million tons of bituminous materials, and 314 million tons of aggregates. Excavation on Federal-aid highway construction amounted to about 1.3 billion cubic yards.

Administration

The Secretary of Commerce, on November 1, 1961, appointed D. Grant Mickle to the new post of Deputy Federal Highway Administrator. This leadership position in the Bureau of Public Roads was established by Public Law 87–392, which also abolished the former position of Commissioner of Public Roads.

During the fiscal year two new primary units were established in Public Roads' Washington headquarters: an Office of Planning and an Office of Highway

Interstate Route 84 winds through Seymour, Conn., on a long viaduct.

Safety. Several other organizational changes were made to improve operations. A manpower utilization study was completed, and its recommendations were being implemented.

Fiscal management was improved in a number of ways. A concurrent audit plan was developed, whereby a State's procedures and reimbursable costs on Federal-aid projects are reviewed and audited by Public Roads concurrently with the progress of the work. Two States had adopted this plan, and others were preparing to do so.

Examination of Federal-aid operations were conducted in 24 States during the year. A number of investigations were made into allegations of irregularities in the highway program. Many were groundless, but some cases were referred to the Department of Justice and resulted in Federal grand jury indictments. Guidelines prepared for inspections of construction and land acquisition were effective in disclosing some previously unrecognized deficiencies and providing prompt corrective action.

The Special Subcommittee of the Public Works Committee of the House of Representatives, headed by Congressman Blatnik, held hearings on irregularities and fraud in right-of-way acquisition in Massachusetts. Public Roads had uncovered this situation, reported it to the Congressional Committee and the Department of Justice, and collaborated with them in the inquiry. Federal-aid payments were stopped until the acquisition of each land parcel was reviewed, and no Federal funds were lost. Several individuals were convicted. With Public Roads assistance, the State's right-of-way operations were being revamped.

Planning

The Public Roads new Office of Planning was created to provide greater concentration on current and long-range planning for highway development. An important activity of the year was support to national organizations of State, city, and county officials in launching an action program to promote cooperative urban transportation planning in cities of 50,000 to 250,000 population.

Both in Washington and in the field, Public Roads and the Housing and Home Finance Agency continued to cooperate closely, encouraging and assisting State highway departments and planning agencies in coordinating their urban planning programs.

Research

Public Roads, with its own staff and in cooperation with the State highway departments, universities, and others, continued its extensive program of research in a wide range of fields related to highways and transportation. Completion of the AASHO Road Test, in which Public Roads collaborated with the States and other organizations, was a significant accomplishment of the year. Six reports on the project were published by the Highway Research Board.

A national cooperative highway research program was initiated by the States, in cooperation with Public Roads and the Highway Research Board. Federal-aid funds available for research were pooled for the undertaking of projects of nationwide interest and value.

Interstate Route 80 heads toward Golconda Summit in western Nevada.

Safety

The Public Roads new Office of Highway Safety was established to coordinate efforts of governmental and private agencies in this important field. It also provides assistance and technical advice to the revitalized President's Committee for Traffic Safety and the new Interdepartmental Highway Safety Board created by the President and comprised of the heads of seven major Federal agencies. Through such activities and through promotion and the sponsorship of research, Public Roads was intensifying its efforts to improve highway safety.

The National Driver Register Service started operation at the beginning of the year. Over 180,000 records were received from the States on drivers who had lost their licenses for drunk driving or involvement in a fatal accident. Some 240,000 searches were made at States' requests, and 5,700 drivers with records in the Register were identified.

Development of the Federal-Aid Program

For those unfamiliar with the management of highways in the United States, and the operation of the Federal-aid highway program, this very brief account is provided.

To the average highway user, the 3.6 million miles of roads and streets in the United States comprise an integrated network whose purpose is to convey him from his origin to his destination. Officially, this network is composed of a variety of systems. The ownership and responsibility for building, maintaining, and operating roads and streets is divided, roughly according to their relative importance and type of service, among the highway departments of the States, counties, towns and townships, and municipalities.

In some cases the State highway system is relatively small; in some the State administers both a primary and a secondary system; in a few the State controls all or most roads. Many urban freeways and major streets are parts of the State highway systems. Special authorities have been created in some States to operate toll roads and toll bridges.

State highways almost altogether, and local roads and streets to a considerable extent, are financed from highway-user taxes, principally motor-fuel taxes and vehicle registration fees.

The Federal Government has for many years had a continuing grant-in-aid program to assist the States in highway improvement. The Federal interest stems from provisions in the Constitution to establish post roads, regulate commerce among the States, provide for the national defense, and promote the general welfare. The national interest is in the improvement of highways, and Federal-aid grants may be used only for that purpose. The entire burden of maintenance, administration, and regulation falls upon the States and localities.

While Federal assistance is directly available only to the State highway departments, it benefits local rural and urban governments as well, since many urban streets and secondary roads are on the systems eligible for Federal aid.

The Federal-aid highway program is administered by the Bureau of Public Roads, U.S. Department of Commerce. The program is a cooperative one, in which the States choose the systems of routes for development, select and plan the individual projects to be built each year, and award and supervise the construction contracts. The States pay for the work and then claim reimbursement for the Federal share of the cost. The Bureau of Public Roads' function is that of review, approval, and control, in each succeeding step. This process recognizes the paramount rights of the States, who own the roads and must maintain and operate them. Where secondary roads or urban streets are involved, the State highway departments, in using Federal aid, work cooperatively with the local governments.

Federal aid to the States for highway improvement had its modest beginning in the Federal-Aid Road Act of 1916. Through the years, without interruption except in World War II, the program has continued to grow in size and importance commensurate with the explosive growth of motor-vehicle transportation in the United States. For almost two decades, use of Federal aid was restricted to rural portions of what now constitutes the Federal-aid primary highway system, an extensive network including most of the country's main-traveled roads. Since 1934 Federal aid has also been extended to the urban portions of this system, and since 1944 to a Federal-aid secondary highway system of farm-to-market roads.

In 1944 also, the National System of Interstate and Defense Highways was authorized by law. This Interstate System, as it is commonly called, is now limited to 41,000 miles in extent, and constitutes the most important portions of

the Federal-aid primary system. Federal-aid funds, however, were not specifically authorized for the Interstate System, or were provided only in relatively modest amounts, until 1956.

The Federal-Aid Highway Act of 1956, augmented by acts in each of the years 1958–61, authorized a tremendously enlarged highway program which, in its entirety, will be the greatest peacetime construction program in history. The legislation extended at an increasing rate the traditional aid for primary, secondary, and urban highway improvements, and authorized a long-range Federal-aid program for completion of the Interstate System. The 1956 act also established a Federal highway trust fund to receive Federal highway-user excise taxes such as the Federal motor-fuel tax, and from which funds for Federal highway aid are disbursed. The Federal-aid program is thus entirely paid for by highway users.

The Federal-aid authorizations are made in four categories: For the Interstate System, and for primary, secondary, and urban highways—the latter group is often referred to as the ABC program. Authorizations of Federal aid for the Interstate System total $37 billion, spread over the 15 fiscal years 1957-71. Authorizations for the ABC program, usually made biennially, rose $25 million annually from $825 million for fiscal year 1957 to $925 million for 1962. The 1963 authorization was also $925 million. Federal-aid funds for the ABC program are apportioned among the States according to formulas prescribed by law, taking into account population, area, and postal route mileage. Interstate funds are apportioned among the States on the basis of the estimated cost of completing the system in each State, to ensure simultaneous completion of the system in all States.

Interstate funds are matched by the States on a 90-percent Federal, 10-percent State basis; the ABC funds are matched 50–50. States with large areas of public lands receive a proportionately larger Federal share of the cost of each project.

As of December 31, 1961, the Federal-aid primary system totaled 266,344 miles in extent, including the Interstate System. There were 613,195 miles in the Federal-aid secondary system. The urban portions of the primary and secondary systems totaled 40,823 miles.

The National System of Interstate and Defense Highways

The Interstate System, officially known as the National System of Interstate and Defense Highways, is a 41,000-mile planned, integrated network of the Nation's most heavily traveled routes, linking the country's metropolitan areas and industrial centers, serving the national defense, and connecting with routes of continental importance in Canada and Mexico. Comprising little more than 1 percent of the total U.S. mileage, the system when completed in 1972 will carry over 20 percent of the Nation's traffic.

Status at end of year

The concentrated efforts of the State highway departments, Public Roads, and the contractor, materials, and equipment industries were reflected in the outstanding progress made during the 6 years of the Interstate program's existence. At the end of the fiscal year, 12,550 miles of the Interstate System were open to traffic.

Of these sections open to use, 7,225 miles were completed to standards adequate for 1975 traffic, the program's objective; and 3,024 miles were improved to full capability for handling current traffic but needed additional improvement to bring them up to the standards for 1975. These accomplishments had been achieved with Federal-aid and other public funds.

Interstate Routes 74 and 465 meet on the west side of Indianapolis, Ind. Interstate 465, running across the picture, is part of the Indianapolis circumferential freeway.

In addition, 2,301 miles of toll roads, bridges, and tunnels had been incorporated in the system. Their inclusion is permitted by law, but Federal-aid funds may not be used for their improvement and they continue to operate as toll facilities.

More than half of the mileage open to traffic, 8,026 miles, had been built or improved under the Federal-aid Interstate program, most of it under the 90-percent Federal, 10-percent State sharing program launched in 1956. Work on the remaining 2,223 miles (other than toll facilities) was financed by the States and localities, mostly before 1956, under other programs—in many cases with Federal aid.

In addition to the sections open to traffic, 4,801 miles were under construction with Federal-aid Interstate funds at the end of the fiscal year, and engineering or right-of-way acquisition was in progress on another 10,927 miles. Thus some form of work was completed or underway on 28,278 miles of the 41,000-mile system—about 69 percent of the total.

The status of improvement of the Interstate System is shown in summary in the table on this page and by States in appendix table 11. A map showing the general location of sections completed or underway appears on pages 54–55.

Status of improvement of the Interstate System as of June 30, 1962

Improvements	Financing with—		Total [3]
	Interstate funds [1]	Other public funds [2]	
	Miles	*Miles*	*Miles*
Improved and open to traffic:			
Completed to full or acceptable standards	6,649	576	7,225
Improved to standards adequate for present traffic but additional improvement needed to meet full standards	1,377	1,647	3,024
Toll facilities	----------	----------	2,301
Total improved and open to traffic	8,026	2,223	12,550
Improvements underway with Interstate funds:			
Under construction	4,801	----------	4,801
Preliminary engineering or right-of-way acquisition underway	10,927	----------	10,927
Total improvements underway	15,728	----------	15,728
Total completed, improved, or underway	----------	----------	28,278

[1] Including State matching funds. [2] Including some Federal aid. [3] Including toll facilities.

Development of the system

The Interstate System was created, with a 40,000-mile limitation, by the Federal-Aid Highway Act of 1944. General locations of 37,700 miles of intercity routes were officially designated in 1947, and 2,300 miles of routes around, into, and through cities were designated in 1955. Taken into account in the selections, made cooperatively by the States and Public Roads, were the basic factors of population service, transportation requirements of industry, commerce, and agriculture, system integration, and needs of national defense.

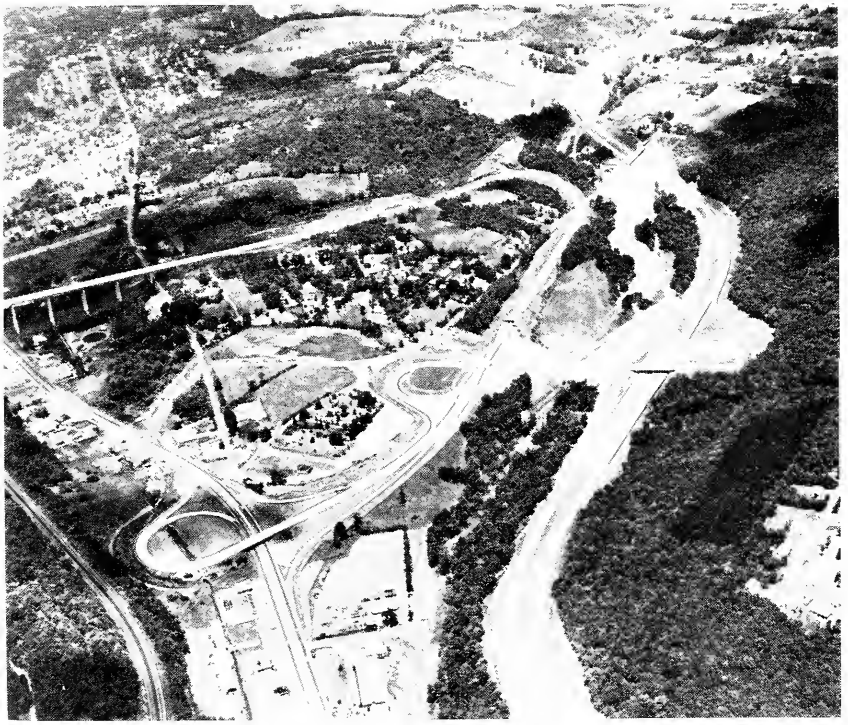
The Federal-Aid Highway Act of 1956 provided a 1,000-mile increase in the limitation of the Interstate System; and about that time it became evident, as the States selected detailed locations for the routes of the originally designated 40,000 miles, that considerable mileage saving had resulted from adoption of alinements more direct than those of existing highways. As a consequence, 2,100 miles of additional routes were designated in 1957 within the 41,000-mile limit.

At the end of the fiscal year the designated Interstate System totaled 40,798 miles of which 35,541 were rural and 5,257 were urban. The remaining 202 miles within the 41,000-mile limitation were held in reserve for adjustments as final locations are selected and projects built. The States continued to make economic and engineering studies and to hold hearings to determine the most feasible locations for individual Interstate route sections, as a prelude to preparation of final plans and surveys, right-of-way acquisition, and construction. Definite or feasible locations had been selected by the States and approved by Public Roads for all routes.

Until 1956, only limited amounts of Federal-aid funds were specifically authorized by Congress for Interstate System improvement, although Federal-aid primary and urban funds could be and were used to a considerable extent for that purpose. The picture changed radically when the 1956 act authorized almost $25 billion of Federal-aid funds over the 13-year period 1957–69 for completion of the Interstate System, to be matched on a 90-percent Federal, 10-percent State basis. A much more detailed estimate of the cost of completing the System made in 1958, and confirmed by another detailed estimate

in 1961, showed that the total amount of Federal funds needed would be $37 billion. The Federal-Aid Highway Act of 1961 has provided the necessary increased authorizations and revenue.

Federal-aid authorizations for the Interstate System totaling $11.4 billion, for the fiscal years 1957–62, had been apportioned to the States prior to the fiscal year. The $2.4 billion of Interstate funds authorized for fiscal year 1963 was apportioned to the States on August 17, 1961.



North of Scranton, Pa., triple trumpet interchanges link Interstate Route 81, on the right side of the picture, U.S. Routes 6 and 11, at the lower left, and the northern terminus of the Northeast Extension of the Pennsylvania Turnpike, which comes in from the left on a high viaduct. (Paralleling U.S. 6 and 11 at the lower left is a railroad.)

Progress during the year

The details of route selection, making of surveys and plans, acquisition of right-of-way, and construction of projects of the magnitude and complexity involved in the Interstate System often take 3 or 4 years from conception to completion. Many route sections are being built in stages, with an initial project for grading and drainage and a subsequent project for paving. Some existing highways are improved and augmented to attain Interstate standards; for example, by acquisition of access control, or by adding another roadway to a 2-lane road, to make a 4-lane divided freeway.

Much was accomplished in the Interstate System program during the fiscal year. The mileage of the system completed to full standards was increased by 1,675 miles, or 4.6 miles per day. The mileage actually in use (fully or partially improved) was increased by 1,725 miles, a growth of 16 percent.

Improvements involving Federal-aid Interstate funds were completed during the year on 2,655 miles of the Interstate System at a total cost of $1.79 billion, of which $1.59 billion was the Federal share.

Work completed during the year included 1,765 miles of bituminous and portland cement concrete surfacing, 835 miles of grading, drainage work, and temporary surfacing, and 55 miles of structures involving 548 bridges over streams, 1,447 bridges over highways to provide traffic grade separations, and 139 railway-highway grade-separation structures.

Prospects for good progress lay ahead. Improvements were programed during the year on 3,376 miles, with an estimated cost of $2.76 billion including $2.37 billion of Federal-aid Interstate funds.

At the end of the year a total of $1.26 billion worth of work was in program status, and 5,753 projects with a total estimated cost of $6.8 billion were underway or scheduled to start soon.

Excluding projects that have only been programed, a total of $13.2 billion had been obligated for the Interstate System at the end of the fiscal year, of which 6 percent was for preliminary engineering, 23 percent for right-of-way acquisition, and 71 percent for construction. At the end of the previous year $10.9 billion had been obligated, of which 70 percent was for construction.

Safety features of the system

Controlled access, planned interchanges, separated roadways, and other modern design features make the Interstate routes remarkably safe and at the same time permit uniform and reasonably high speed of travel. A study made during the year indicated that when the system is completed it will save over 5,000 lives a year, 25 percent more than had been previously predicted.

It was estimated that the average of 11,000 miles of the system open to traffic during 1961 saved 2,000 lives that would otherwise have been lost in traffic accidents, and resulted in 25,000 fewer injuries and 60,000 fewer accidents than would have otherwise occurred. The dollar saving in 1961 accident costs was estimated to be well over $100 million.

Interstate System Progress: Case Histories

Progress in the development of the Interstate System during the 6 years since the accelerated program was launched in 1956 is shown by the statistics in the previous section. Far more impressive to the average motorist or trucker, however, were the many completed sections open to their use, ranging from a few miles to several hundred miles in length. The red-white-and-blue Interstate route marker had become widely recognized as a beacon signaling swift, safe, tension-free driving. Travelers noted, too, the promise of the future in the big construction jobs they saw underway, although sometimes their patience was tried by the necessary detours or delays at construction operations. But the individual driver was apt to know only of Interstate progress in his own locale or along the route of his last business or vacation trip. A close-up picture of progress across the Nation may be gained, perhaps, by glimpses of typical Interstate projects completed or underway during the fiscal year. (I– is used to designate the term Interstate Route, with the appropriate number.)

Alabama.—A 7-mile section of I–20 was completed at a cost of $5.2 million between Eden and Riverside. Opening of this section to traffic will provide 34 miles of continuous 4-lane freeway from the center of Birmingham on the route to Atlanta.

California.—Construction of the interchange of I–10—the Santa Monica Free-

A connecting link from Interstate Route 5 (on the right) joins Harbor Drive at the edge of downtown Portland, Oreg. An area prepared for urban redevelopment appears at the upper left.

way—and the Harbor Freeway was completed during the year. The $9 million project included east- and west-bound 3-lane freeway viaducts and 11 distributor and connector roadway bridges. This project was the final link in a 23-mile freeway loop surrounding the downtown area of Los Angeles, started in 1957. Anticipated traffic on the Santa Monica Freeway just west of the interchange is 70,000 vehicles a day in 1962, with a projection of 180,000 in 1980. Parking areas will be established under the Santa Monica Freeway at 52 locations. Five locations had been awarded to high bidders, with monthly rentals to the State averaging $327 per acre.

Colorado.—A graceful steel bridge across the Colorado River in the scenic Palisade region near Grand Junction was completed on I–70 during the year. The 1,100-foot, 4-lane bridge is the first link in the Grand Junction bypass. The old highway is hemmed in by a railroad and densely populated farmland.

Connecticut.—A 15-mile section of I–84 was completed during the year from the New York State line eastward past Danbury to Newtown. The 4-lane freeway, costing $28 million, was built in 27 months. Construction included 11 miles of ramps and interchange roadways and 51 structures. The route will relieve parallel U.S. 6, which is narrow and inadequate for present traffic and passes through the congested business district of Danbury.

District of Columbia.—The second of a pair of bridges carrying I–95 across the Potomac River between Virginia and Washington, D.C., was completed during the year. The new 2,300-foot, 4-lane bridge cost $5.2 million. It closely resembles its twin built in 1950, but use of welded construction instead of riveting saved an estimated $500,000. The new bridge has greatly reduced the heavy traffic congestion and frequent minor accidents that occurred on the narrow truss bridge, built in 1904, which it replaces. Traffic on the twin bridges averaged 120,000 vehicles a day.

Florida.—A 4-mile project completed during the year opened up a 33-mile continuous section of I–10 extending westward from the western urban limits of Jacksonville. At Orlando, completion of a large viaduct as part of I–4 provided space for a 927-car municipal parking lot beneath the structure, greatly relieving the downtown parking situation.

This 13-mile, $3.8 million section of Interstate Route 65 in Escambia County, Ala., is part of the route from Mobile to Montgomery. (Not yet open to traffic when this photograph was made.)

Georgia.—On I–75, the main north-south Interstate route in Georgia, about half of the 165 miles between Macon and the Florida State line was open to traffic and all of the remainder was under construction, with a substantial portion scheduled for early completion.

Idaho.—A 25-mile section of I–80 running easterly from the Oregon State line was open to traffic except for 7 miles on which construction was nearing completion. Twin 966-foot welded plate-girder bridges span the Snake River at the State line. The new 4-lane freeway relieves congestion on U.S. 30 and will afford considerable benefit in time and travel savings since it is 5½ miles shorter than the old route.

Illinois.—A 24-mile portion of I–70, centering around Effingham, was completed during the year. East-west route I–70 and north-south route I–57 join 2 miles southwest of Effingham and continue together to a point northeast of town. At both junctures a tri-level interchange structure was built. I–70 will relieve congestion on U.S. 40, the old "National Road," which carried 7,000 vehicles a day in 1960. Projected daily traffic on I–70 in 1975 is 17,000. Commercial and real-estate development has already begun around Effingham, along I–70.

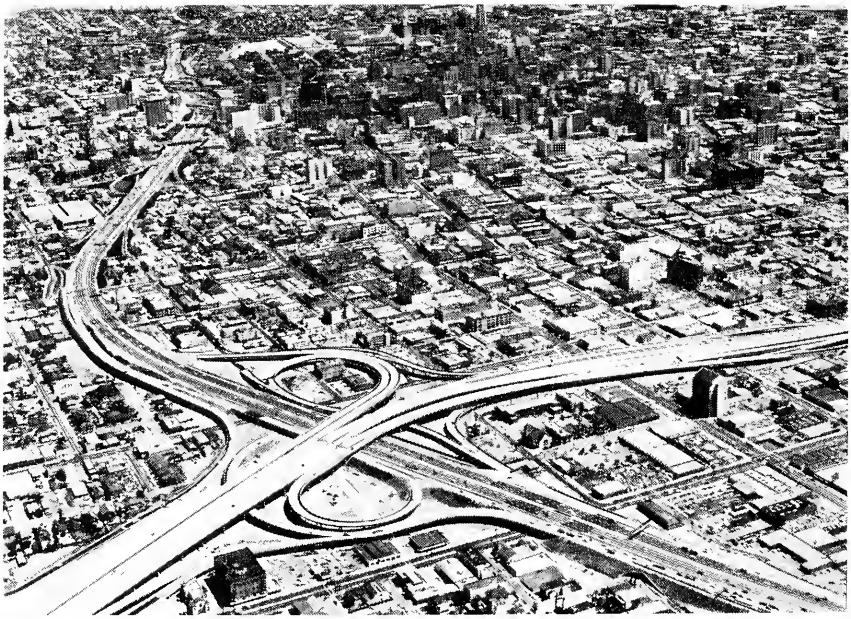
Indiana.—A 10-mile section of I–70 was completed westward from the Ohio State line, and 7 miles of the project were opened to traffic. The construction included 26 bridges: 8 over streams, 5 over railroads, 7 over highways, and 6 at interchanges. The opened section bypasses Richmond and has relieved heavy congestion on U.S. 40.

Kansas.—In addition to accomplishments on I–70 in Illinois and Indiana, just described, Kansas completed several long stretches of I–70 during the year, illustrating the cross-country development of Interstate routes. Opened to traffic in eastern Kansas were two sections totaling 27 miles, between Salina and Topeka, and an additional 14 miles were under construction. There remained only 11 miles of I–70 to be constructed on the 173 miles from Salina to Kansas City. In the wheat country of western Kansas a 23-mile project was also completed on I–70, putting into service a continuous freeway stretch of 44 miles.

Kentucky.—During the year a 21-mile section of I–64 was completed between Frankfort and Middletown, opening the full length of the freeway from Louisville to Lexington except for a short section at Frankfort. The parallel old 2-lane road, U.S. 60, carried 9,000 vehicles a day in June 1961 and was operating at capacity. It passes through many small towns with speed zones of 25 miles per hour. In June 1962, after 6 months of operation, I–64 was carrying 6,600 vehicles a day and traffic on U.S. 60 had dropped to 3,300.

Louisiana.—Work continued on the 5.4-mile twin bridges which will carry I–10 across Lake Ponchartrain east of New Orleans. Across the State to the west, an interchange was completed on I–10 at Louisiana Route 108, serving the industrial and port area of Lake Charles City.

Maine.—The 24-mile section of I–95 between Augusta and Fairfield completed in 1960 received a national award during the year as the Nation's best example of a "driver's road"—a combination of scenery, speed, and safety. The State was praised for the imaginative way in which the independent roadway design capitalized on the area's natural beauty and at the same time effected overall economy of cost. Traffic on the roughly paralleling U.S. 201 had dropped from 5,800 to 3,300 vehicles per day; I–95 was carrying 3,800, with predictions of 10,500 by 1975. The fatality rate from accidents on I–95 was less than 1 per 100 million miles of travel, and the accident rate on U.S. 201 had declined. During the year another 5-mile section of 4-lane freeway was completed on I–95 between Bangor and Orono. From Orono north to the Canadian boundary, I–95 will be built as a 2-lane controlled-access highway.



Interstate Route 10, the Santa Monica Freeway, meets the Harbor Freeway in Los Angeles, Calif., at an interchange designed for extremely heavy traffic movements.

Maryland.—The Baltimore Beltway, I–695, was opened to traffic in its entirety on July 1, 1962. The 33 miles of freeway, together with the Harbor Tunnel (toll) Thruway, completely ring the city of Baltimore and bind together a dozen suburbs. There are 32 interchanges, including a $4 million "reverse-flow" interchange at the Northeastern Expressway where motorists going to the left actually veer left in a long, gradual turn without decreasing normal freeway speed. This eliminates the tight curves and slow-downs inherent in a cloverleaf interchange. The beltway, begun in 1954, cost $68.5 million. Early planning resulted in a minimum of dislocation, with only 300 dwellings removed from the right-of-way. Average traffic on the beltway soon after opening was 22,000 vehicles a day, ranging up to 35,000 near the west junction with U.S. 40. The 1975 forecast is for 65,000 vehicles daily. Some 1,600 acres of land within 2½ miles of the beltway have been rezoned for industrial use, 825 of which are adjacent to the freeway. Baltimore County expects developments of the next decade along the beltway to create 5,000 new jobs.

Massachusetts.—During the year several projects were completed on I–93 north of Boston. A 2½-mile, 8-lane section in Stoneham required careful drainage planning where its skirts a water-supply reservoir. Another 1.3-mile, 8-lane project in Stoneham required heavy cuts in rock ledge. Traffic on these sections is expected to be about 60,000 vehicles a day in 1980. Another 2½-mile section of I–93 was built in Methuen, with 6-lane width.

Michigan.—During the year 28 miles of I–75 were completed between Flint and Bay City, and 27 miles were opened to traffic between Grayling and Gaylord. Michigan also completed a 33-mile relocation of U.S. 10 between Bay City and Clare, and a 57-mile relocation of U.S. 27 from Clare to Grayling. With these openings, 145 miles of 4-lane divided highway were provided for free-flowing travel between the urban areas of southeastern Michigan and the recrea-

tional lake and forest country in the north central part of the State. Driving time from Flint to Gaylord has been reduced from 3½ to 2½ hours.

Minnesota–Wisconsin.—Completion in December 1961 of the 7,975-foot bridge linking Duluth, Minn., and Superior, Wis., was the culmination of promotion and planning that began some 30 years ago. Construction finally became possible through the Interstate System program. The $30 million structure, part of I–535, replaces a low-level private toll bridge built a half-century ago. The new bridge was already carrying as much traffic as was forecast for several years ahead. The high-level bridge permits uninterrupted passage of both highway and waterway traffic.

Mississippi.—During the year 6 miles of I–59 were opened to traffic through the city of Laurel, skirting close to the business center. The project included a major bridge over two highways and a number of railroad tracks. The project cost $7.8 million of which right-of-way accounted for $2.3 million.

A tri-level interchange interconnects Interstate Routes 57 and 70 southwest of Effingham, Ill. Each of the three levels carries traffic in one direction only.

Missouri.—With the opening of a 6-mile section of I–70 on the Mark Twain Expressway in St. Louis, motorists now have in use a freeway reaching 24 miles from downtown St. Louis to west of St. Charles. The section recently completed extends from the northwest city limits to downtown St. Louis and has 8 traffic lanes, the center 2 being reversible to permit 5 lanes in operation in the direction of heavy traffic flow. The reversible lanes, located between the outer 3-lane roadways, are opened and closed for directional use by pulling miniature 14-car "railroad trains," serving as guard rail and channelizers, into different positions. First of their type, the trains were designed by the Missouri State Highway Department. Electrically operated signs inform motorists whether the center lanes are open to inbound or outbound traffic. The new route has reduced travel time from downtown St. Louis to the airport by as much as 50 percent in peak hours. The route was carrying 65,000 vehicles per day, with expectations of 105,000 in 1975.

Nevada.—A 13-mile section of I–80 was completed over Golconda Summit, 200 miles east of the California State line. The 4-lane freeway, traversing a mountainous area, replaces an old 2-lane road with sharp curves and steep grades, on which there have been 12 fatalities in recent years.

New Hampshire.—The east-west bypass of Manchester was opened to traffic during the year with completion of Interstate projects on I–93 and I–193 and

Federal-aid primary projects on relocated N.H. Route 101. The 9-mile bypass, which cost $11.8 million, removes from Manchester's congested streets the heavy summer traffic traveling from the west to the coastal beaches. The bypass is 0.3 mile longer than the route through town, but driving time has been reduced from 30 minutes to 9.

New Jersey.—Almost 7 miles of I–295 were completed during the year in Gloucester and Camden Counties. The 4-lane freeway was built with provision for adding 2 more lanes, expected to be needed before 1975. This freeway section includes 12 bridges and 9 sign "bridges." I–295, a peripheral route around the Camden metropolitan area, is expected to carry 85,000 vehicles a day in 1975, 25 percent of them trucks.

New Mexico.—A 6-mile section of I–25 was completed during the year at a cost of $1.2 million. This 4-lane freeway bypasses Raton, reducing traffic congestion in the city.

New York.—Completion of 19 miles of I–81 in Oswego County opened to traffic a 70-mile stretch of freeway from the heart of Syracuse to north of Watertown. The 19-mile section completed during the year cost $10.5 million and includes 5 twin bridges and 14 other crossing structures. Other sections of I–81 completed in New York include 10 miles south of Syracuse and 8 miles south of Binghamton, the latter connecting with 40 miles in Pennsylvania reaching almost to Scranton. There were 61 accidents in Oswego County on old U.S. 11 during 1961, compared with 4 on I–81 during the last half of 1961.

North Carolina.—As the fiscal year came to a close, four major sections of the Interstate System were approaching completion to full standards: a 14-mile section of I–40 from Old Fort to Marion; an 11-mile section of I–85 from Gastonia to Charlotte; a 52-mile section of I–85 from Greensboro through Durham; and a 19-mile section of I–95 between Fayetteville and Lumberton. Parts of the Greensboro–Durham section have been under stage construction since 1951 as the major thoroughfare for this portion of the industrial Piedmont area of the State. All of these 4-lane freeway sections replace highways built in the 1920's to serve both rural traffic and as main streets for numerous small towns and cities.

North Dakota.—A 25-mile section of I–94 was under construction and scheduled for completion next year, 65 miles west of Bismarck. Aggregate material had to be hauled 52 miles to the project site. I–94 will replace U.S. 10 as a main route. U.S. 10 had 62 accidents and 5 fatalities within 2 years on a 34-mile stretch.

Interstate Route 80 a few miles east of Laramie, Wyo., was designed with independent roadways to overcome economically the difficult topography.

Ohio.—Construction was nearing completion on 16 miles of I–90, running easterly from downtown Cleveland. When this section is opened to traffic it will be possible to travel on controlled-access highways from Cleveland to Boston, Mass.

Oklahoma.—On the 7-mile section of I–40 from its junction with I–35 in Oklahoma City southeasterly past Tinker Air Force Base, 4 miles were opened to traffic and the remainder was nearly completed. The 5 miles to the Base main gate are a 6-lane freeway. Total cost of the 7-mile project is $11 million for construction. Local interests provided right-of-way. The old inadequate road between Oklahoma City and the Air Force Base was called "Blood Alley" because of its bad accident record. The new route, already carrying 25,000 vehicles a day, has relieved congestion and is saving lives. Highway-user savings on the new 7-mile route are expected to be $2½ million next year and will reach $6 million in 1972. At this rate the cost of the facility will be paid for in user savings by 1965.

Oregon.—A 6½-mile section of I–5 through southwest Portland to the downtown area was completed during the year, at a cost of $16.5 million. Both through and suburban traffic were using the new route, relieving crowded U.S. 99W. Traffic on the old route had averaged 35,400 vehicles per day but dropped to 15,800 after the freeway opened. The freeway was carrying 22,800. In a 5-month period before the freeway opened, U.S. 99W had an accident rate of 11.04 per million miles of travel; in a comparable period afterwards it dropped to 6.38, and the rate of the freeway was only 0.97. Accident costs for the "before" period were estimated at $423,000; for the "after" period, $176,000. This indicates an annual accident cost saving of $460,000. Average weekday time savings for drivers on the freeway were estimated at 1,330 hours, plus 174 hours saved daily for drivers using the old route. This represents an estimated time saving of $1 million a year.

Pennsylvania.—Sections of I–81 completed during the year opened a continuous 48-mile freeway stretch from Scranton to the New York State line and on to Binghamton, N.Y. A major interchange was built near Clarks Summit to connect I–81 and 81–S, U.S. 6 and 11, and the terminus of the Northeast Extension of the Pennsylvania Turnpike. State funds were used for the turnpike part of the connection. Near Scranton, a triple-deck structure was built as part of the "direct-flow" interchange of I–81, 81–S, and 84 and U.S. 11 and 611. This construction, in an area uprooted by strip mining, transformed the desolated countryside and opened adjoining land for reclamation development.

Rhode Island.—Construction was underway on a section of I–95 in Pawtucket, and Massachusetts was building an adjacent section in Attleboro. Completion of the work will provide 10 miles of freeway to relieve crowded, dangerous U.S. 1.

Tennessee.—A directional interchange for I–40, I–65, and U.S. 70 and adjacent twin bridges over the Cumberland River were under construction at Nashville. The complex of structures will cost $7.2 million.

Texas.—Adjacent to the downtown area of Houston, the Capital Avenue interchange on I–45 was completed during the year. This connects with a completed elevated freeway and a 9-mile section of I–45 which was under construction.

Utah.—Construction completed and underway on I–80N will soon provide a 13-mile section of freeway near Ogden.

Vermont.—Work was nearing completion on 7½-miles of I–89, providing a freeway bypass of the Burlington–Winooski area. The new route will relieve the city streets of through traffic and a large amount of commuter traffic. Several shopping centers and motels are being developed near the Interstate route interchanges.

West Virginia.—Beginning 7 miles north of Charleston and extending northerly, an 18-mile section of I–77 was completed during the year. Design or construction was underway on a number of other portions of I–77 in the State. The new 7-mile freeway replaces an old 18-foot road which had 44 accidents in 2 years. Travel speed on the new route is double the old.

Wisconsin.—The first 3½ miles of I–94, extending from downtown Milwaukee past the County Stadium, home of Milwaukee's baseball team, was opened to use during the year and was providing considerable traffic relief to other nearby routes. The remainder of this east-west freeway will be completed next year, opening 15 miles of freeway westerly from the downtown area.

Wyoming.—Twin bridges on I–90 across the "mile-wide, inch-deep" Powder River were completed during the year. Work continued on the 67-mile stretch of I–90 between Buffalo and Gillette, with 2 of the 4 lanes scheduled for opening in the fall of 1962. This route, on new location, will save 28 miles of travel between the two cities.

The Mamalahoa Highway from Papa to Manuka Park, on the Island of Hawaii, was built with Federal-aid funds. The 10-mile, 2-lane highway section replaces a substandard county road and is a link in the belt route around the island.

Federal-Aid Improvement of Primary Highways

THE FEDERAL-AID PRIMARY HIGHWAY SYSTEM, as of December 31, 1961, covered 266,344 miles of the principal highways of the Nation and included 240,646 miles of main rural roads and 25,698 miles in urban areas. These mileages include the Interstate System which by law is a part of the primary system.

Federal-aid primary fund authorizations, which may be used for either rural or urban portions of the primary system, have ranged upward in recent years from $247.5 million for fiscal year 1954 to $416.25 million for fiscal year 1963 of which $312,187,500 was apportioned on August 17, 1961, and the remainder on October 10, 1961.

During the fiscal year 5,050 miles of improvements, estimated to cost over $803 million and involving $425 million of Federal-aid primary funds, were programed.

Improvements involving Federal-aid primary funds were completed during the year on 5,377 miles of the Federal-aid primary system at a total cost of $688 million of which $359 million was Federal aid. The projects completed included 4,605 miles of bituminous and portland cement concrete surfacing, 908 bridges over streams, and 237 bridges over highways to provide traffic grade separations. In addition, railway-highway crossings were eliminated by construction of 104 grade-separation structures and 10 existing structures were reconstructed; 89 grade crossings were protected by installation of signal devices.

Building this expressway relocation of U.S. 131 through Grand Rapids, Mich., required careful planning, since the right-of-way was hemmed in by heavy industrial development, a river, and three railroads. The 4.7-mile expressway cost $20 million and was partly financed with Federal-aid urban funds.

Federal-Aid Improvement of Urban Highways

HIGHWAYS IN URBAN AREAS eligible for improvement with Federal aid as of December 31, 1961, totaled 40,823 miles of which 25,698 miles were on the Federal-aid primary system (including the Interstate System) and 15,125 miles were on extensions of the Federal-aid secondary highway system.

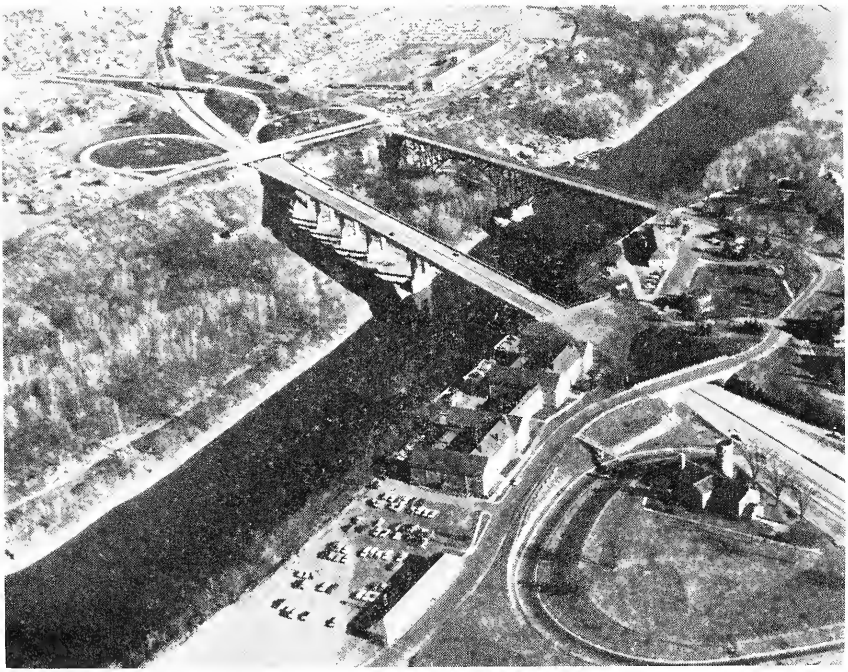
During the fiscal year, 36 percent of all work programed on the Interstate System was for improvement in urban areas. This is somewhat less than the urban share of the estimated cost of improving the Interstate System and of travel in the United States; in both cases the urban proportion being nearly half.

Federal-aid urban fund authorizations have increased in recent years from $137.5 million for fiscal year 1954 to $231.25 million for fiscal year 1963 of which $173,437,500 was apportioned on August 17, 1961, and the remainder on October 10, 1961. During the year, in addition to the funds approved for proj-

ects from the Federal-aid urban authorizations, 7 percent of all primary Federal-aid highway funds were approved for urban highway work.

Plans approved for Federal-aid construction projects in urban areas during the past fiscal year totaled $1.70 billion and covered 865 miles of highway improvement. Of this total, $1.23 billion was Federal aid, comprised of $259 million from the urban authorizations, $28 million from the primary fund authorizations, and $938 million from Interstate funds.

Federal-aid construction work in urban areas completed during the fiscal year consisted of 889 miles of highway improvements costing $1,228 million of which $937 million was Federal aid. The completed work included 743 miles of bituminous and portland cement concrete surfacing, 248 bridges over streams and rivers, and 751 bridges to provide traffic grade separations between crossing highways. In addition, 169 railway-highway separation structures were completed and 28 existing ones were reconstructed, and 73 railroad grade crossings were protected by installation of signal devices.



This new 1,200-foot bridge crossing the Mississippi River links Minneapolis and St. Paul, Minn. To restore the historic setting of old Fort Snelling and to provide an essential parking area, the highway was carried through a 300-foot tunnel on donated right-of-way at the right end of the bridge. Part of the $3.8 million project cost was paid for with Federal-aid urban funds.

Secondary or Farm-to-Market Roads

THE FEDERAL-AID SECONDARY NETWORK of farm-to-market, feeder, schoolbus, and mail-route roads is the largest of the Federal-aid highway systems. Its length as of December 31, 1961, was 613,195 miles, including 15,125 miles of extensions into or through urban areas. The Federal-aid authorizations for this system have increased from $165 million for fiscal year 1954 to $277.5 million for

fiscal year 1963 of which $208,125,000 was apportioned on August 17, 1961, and the remainder on October 10, 1961.

During the fiscal year a total of 11,986 miles of improvements, estimated to cost $577 million and involving $302 million of Federal-aid secondary funds, were approved on the secondary system. Improvements were completed during the year on 12,668 miles of the secondary system at a total cost of $481 million, involving $249 million of Federal-aid secondary funds. Of the improvements completed, 8,578 miles involved bituminous or portland cement concrete surfacing, 3,234 miles were gravel or stone surfaced, and 816 miles were graded and drained preparatory to receiving surfacing. Also completed were 1,769 bridges over streams and 11 bridges over highways; 54 new railway-highway grade separation structures and reconstruction of 5 others; and protection of 253 other railway-highway crossings by signal devices.

This Federal-aid secondary project on New Mexico State Route 3 provided 9.3 miles of improved alinement and asphaltic-treated base course and 2 bridges between Rockwall and Tres Ritos. The road is also part of Forest Highway Route 3.

The Federal-aid secondary program differs from other Federal-aid highway programs in that the system is not limited in length and the routes of the system and the projects to be constructed are selected cooperatively by the State highway departments and local highway officials. Another difference is that under the 1954 act the administrative procedure between Public Roads and the States in carrying on the secondary program may be simplified by the States assuming major responsibility. All States except Alaska, Hawaii, Indiana, and the District of Columbia have adopted the procedure.

The nine-member Board of County Engineer Advisors continued to meet with Public Roads officials to promote better mutual understanding on the Federal-aid secondary program among county engineers, the State highway departments, and Public Roads, and to give effective counsel and advice.

Vermont replaced a narrow, winding gravel road along the North Branch of the Winooski River near Worcester with this 2.8-mile highway, financed with Federal-aid secondary funds. The route serves farm lands, forest operations, and recreation areas.

Repair of Roads Damaged by Natural Disaster

FEDERAL HIGHWAY LEGISLATION provides for a continuing emergency fund in the amount of $30 million, which is replenished as needed on an annual basis, for assisting the States in financing the repair and reconstruction of highways and bridges on the Federal-aid systems seriously damaged or destroyed by floods, earthquakes, or similar catastrophes over a wide area. Eligible projects are financed on the basis of 50-percent State funds and 50-percent emergency funds. The Federal-aid Highway Act of 1959 made it permissible to use these emergency funds to finance up to 100 percent of the cost of the repair and reconstruction of similarly damaged national forest highways and forest development roads and trails, national park roads and trails, and Indian reservation roads within Federal domain lands whether or not these roads are on the Federal-aid systems.

During the fiscal year 1962 the United States was widely affected by several major storms, including Hurricane Carla along the Gulf of Mexico, the great March tidal storms which battered much of the mid-Atlantic seaboard, and extensive flooding in other parts of the country caused by abnormally heavy winter rains and prematurely melting snows. During the year allotments of Federal emergency funds totaling $6,602,520 were made to 11 States to finance rehabilitation work on Federal-aid highways and roads on public domain lands, necessitated by these storms. The total cost of the work was estimated at $10.73 million. Amounts allotted were: Alabama, $626,890; Delaware, $304,500; Iowa, $321,694; Louisiana, $202,040; Mississippi, $392,146; Montana, $2,472,000 (100-percent funds); New Jersey, $563,000; North Carolina, $245,400; South Dakota, $195,750; Texas, $1,039,100; and West Virginia, $240,000.

During the year there were several Presidential declarations of major disasters, bringing the provisions of Public Law 875 into effect with respect to 14 States. In West Virginia and California there were two disasters during the

year. The total cost of assistance provided under Public Law 875 for all types of damage, including damage to roads not on any Federal-aid system, was estimated in excess of $40 million. In nearly all cases the Bureau of Public Roads was called upon to assist in the implementation of emergency repair or temporary replacement of facilities on off-system highways damaged or destroyed by natural causes. Major disasters occurring during the year, as noted above, were Hurricane Carla and the mid-Atlantic coastal storm.

The Highway Trust Fund and Reimbursement Planning

THE FEDERAL-AID HIGHWAY PROGRAM is financed from the Highway Trust Fund established by the Highway Revenue Act of 1956. The Trust Fund's revenue comes from certain Federal highway-user excise taxes earmarked by the same act, as amended in 1959 and 1961.

Net Trust Fund receipts during fiscal year 1962 totaled $2.955 billion and expenditures from the Trust Fund amounted to $2.784 billion. Total revenues of the Trust Fund in the 6 fiscal years 1957–62 amounted to $13.9 billion and expenditures for the same period totaled $13.4 billion.

The Federal motor-fuel taxes have provided four-fifths of the revenue accruing to the Highway Trust Fund, and the taxes on rubber constituted the second largest revenue source. Net receipts by tax source during fiscal year 1962, and the tax rates in effect on June 30, 1962, are shown in the accompanying table.

Status of the Highway Trust Fund, fiscal year 1962

	Amount (thousand dollars)	Percentage of total income
Balance, July 1, 1961	$299,063	
Income, fiscal year 1962:		
Tax revenue (net, after refunds):		
Motor-fuel taxes: 4 cents per gallon	2,373,419	80.3
Tires, tubes, and tread rubber: 10 cents per pound on highway tires and tubes; 5 cents per pound on other tires and on tread rubber	367,453	12.5
Trucks, buses, and trailers: Half of the 10-percent tax on manufacturers wholesale price [1]	127,974	4.3
Heavy vehicle use: $3.00 per 1,000 pounds annually on vehicles of over 26,000 pounds gross weight	79,844	2.7
Total excise revenue	2,948,690	99.8
Interest earned	6,772	0.2
Total income	2,955,462	100.0
Disbursements for highways, fiscal year 1962	2,784,273	
Balance, June 30, 1962	470,252	

[1] The full 10 percent will go to the Trust Fund beginning July 1, 1962.

Reimbursement planning

Reimbursable obligation ceilings, sometimes referred to as "contract controls," have been in effect since October 1959 as a means of regulating new obligations on Federal-aid highway projects so that the Federal funds required to reimburse the States for work done will not exceed revenues accruing to the Highway Trust Fund. Federal funds are "obligated" when the States are authorized by Public Roads to proceed with preliminary engineering work, right-of-way acquisition, or advertising for bids on construction projects.

The schedule for fiscal year 1962 provided for reimbursable obligations totaling $3.274 billion during the fiscal year, in addition to $58 million carried for-

ward from the 1961 schedule. The 1962 schedule was released to the States in equal quarterly installments of $818.5 million, available May 17, August 15, and December 1, 1961, and March 15, 1962, respectively. Reimbursable obligations actually incurred during fiscal 1962 totaled $2.865 billion. The balance of the 1962 schedule carried forward on June 30, 1962, was $467 million.

An additional $948.5 million of reimbursable obligation authority for the first quarter of fiscal year 1963 was made available to the States on June 14, 1962. Corresponding amounts for each of the last three quarters of the fiscal year 1963 were to be released effective on the beginning date of each quarter.

The States are authorized to obligate available balances of apportioned Federal-aid funds for so-called "E" projects, which are financed initially from State funds without charge to the reimbursable obligation schedule. This is done with the understanding that when the State desires Federal reimbursement for such projects, the Federal fund amounts are to be charged to the reimbursable obligation schedule and reimbursement is to be claimed over a 3-year period. Twelve States were financing projects on this basis as of June 30, 1962, involving Federal fund obligations totaling $331 million.

Reports to Congress

President's transportation message

THE PRESIDENT, on April 5, 1962, sent to the Congress an important message on the transportation system of the Nation. A significant section of the report, dealing with urban transportation, was based largely on a joint report on urban transportation submitted to the President on March 28, at his request, by the Secretary of Commerce and the Housing and Home Finance Administrator. Public Roads had an active part in the development and preparation of this report, which was concerned both with transit and private-vehicle transportation, particularly in urban areas. Items related to the Federal-aid highway program are described below.

A major recommendation of the report was that beginning no later than July 1, 1965, approval of Federal-aid highway projects in any metropolitan area should be contingent upon a finding by the Secretary of Commerce (through the Bureau of Public Roads) that the projects are consistent with adequate, comprehensive development plans for the metropolitan area or are based on results of a continuing planning process carried on cooperatively by the States and local communities, and that the Federal-aid system so developed will be an integral part of a soundly based, balanced transportation system for the area involved.

The report also recommended that use of Federal-aid highway funds be permitted for the construction of highway facilities for the exclusive use of specific types of motor vehicles—such as roadways or lanes solely for bus operation—whenever comprehensive transportation plans indicate this to be desirable.

The report proposed that Federal-aid secondary funds, now available only for use in rural areas, also should be made available for expenditure on extensions of the Federal-aid secondary system in urban areas. This will provide for needed development into urban areas of routes important to cities and suburban communities. Such routes often do not have the top priority warranted for expenditure of Federal-aid urban funds.

Recognizing the great need for expanded highway planning and research programs in the States, the report recommended a significant change in the legislation governing use of Federal aid for planning and research. Existing law provides that up to 1½ percent of the Federal-aid funds annually apportioned to the States may be used for planning and research, with or without

the State matching normally required in the use of Federal aid. The report recommended that the use of the 1½-percent funds for planning and research be made mandatory, that full matching be required, and that such funds not so used should lapse. The report also proposed that an additional one-half of 1 percent of the Federal-aid apportioned funds for the ABC program (but not the Interstate program) be earmarked for research.

Highway cost allocation study

The final report of the highway cost allocation study was presented to the Congress during the last fiscal year. Work continued on a supplementary report on cost allocation by the incremental method, using the findings of the AASHO Road Test, which were not available at the time the cost allocation study report was submitted to Congress. Other material updating the information and findings of the report were being prepared for a supplemental report.

Maximum desirable vehicle sizes and weights

Work was continued on the study of maximum desirable sizes and weights for vehicles operated on the Federal-aid highway systems, discussed in last year's report. During the year Public Roads cooperated with the American Association of State Highway Officials in acquiring and analyzing information in this field, which will be useful to both the Congress and the States in determining policy governing motor-vehicle sizes and weights.

Use of materials for the Nation's highways

At the request of the Senate Committee on Public Works, which was investigating the use of materials and new designs and methods in public works, the Bureau of Public Roads prepared a comprehensive report titled *The Use of Materials for the Nation's Highways* (published July 10, 1962, as Committee Print No. 4, 87th Congress, 2d session). The report discussed the scope of the use of materials for highways, methods of exploring for materials, and new and improved design and use of materials for highways. It included a comprehensive listing of new equipment developed and put into use in highway construction. The report described research and development in the use of nuclear and electronic equipment for testing materials and controlling their installation, and showed the high degree of technological refinements being applied in highway construction.

Highway Improvements Under Direct Supervision of Public Roads

Under existing legislation, the Bureau of Public Roads receives and directly administers annual appropriations for major highways through national forests; and performs highway engineering and construction services for other Federal agencies as required by law and as may be requested for specific projects. The principal agencies receiving direct appropriations for the construction and maintenance of roads and requesting assistance from Public Roads include the Departments of Agriculture, Defense, and Interior. In this general program for highway and bridge construction Public Roads makes surveys, prepares plans and specifications, advertises for bids, and supervises the construction of the projects.

During fiscal year 1962, improvements under the direct supervision of Public Roads were completed on 695 miles of roads, involving $57 million of Federal funds. At the close of the year, improvements estimated to cost $109 million were under contract for construction on 1,024 miles. Additional work on 569 miles, estimated to cost $60 million, was either in the programed, plans-approved,

or advertised stage. This active and proposed work, totaling $169 million in estimated cost, is reported by program in the following tabulation:

Forest highways [1]	$77,328,970
Parkways	46,256,476
Park roads and trails	22,189,470
Bureau of Land Management roads	7,831,352
Department of Defense, access roads [2]	7,073,320
Federal-aid in Alaska, Idaho, and Montana for jointly financed projects [3]	2,164,415
Public lands highways	948,989
Forest development roads	2,262,175
Woodrow Wilson Memorial Bridge [4]	94,814
Emergency relief, Montana earthquake area	2,722,000
Miscellaneous reimbursable and special projects	297,412
Total	169,169,393

[1] Excludes forest highway construction under State supervision.

[2] Excludes defense access roads supervised by other than Public Roads.

[3] Excludes Federal-aid highway construction under State supervision. The Federal-aid funds reported here for construction under Public Roads supervision include funds authorized under sec. 3(a) of the Federal-Aid Highway Act of 1958, and also includes funds authorized under special Alaska legislation.

[4] Across the Potomac River south of Washington, D.C.

In addition to these programs, Public Roads had several contracts with consulting engineering firms for the survey and/or design of projects which were under its direct supervision.

A brief coverage of some of the significant activities under the direct supervision of Public Roads is presented in the following paragraphs.

Forest highways

The forest highway system, composed of main and secondary roads within or adjacent to the national forests, is located in 40 States and Puerto Rico. At the close of the year the system had a total length of 25,169 miles, of which 51 percent is in 13 Western States. Although not a wholly connected system, it represents the principal means of transportation into and through the national forest areas, which comprise 8 percent of the total area of the United States. In addition to serving as major traffic arteries, the system is important in the development of natural resources and recreational facilities, and to the welfare of many local communities. Approximately 88 percent of the forest highway system is coincident with the Federal-aid primary and secondary highway systems. Table 18 of the appendix shows, by forest road class, the system mileage in each State.

Public Roads generally directly supervises the construction of forest highways in the Western States where such construction is largely financed from forest highway funds. In the East, where the apportionment of forest highway funds to any one State is relatively small and generally is supplemented on individual projects by Federal aid, State, and/or local funds, the construction is usually administered by the State highway departments.

During the fiscal year 48 forest highway construction projects, involving 265 miles and $19 million of Federal funds, were completed under Public Roads direct supervision. At the close of the year 75 other projects, similarly supervised, were under contract for improvement on 516 miles. They involved Federal funds totaling $49.1 million. Some of the improvements completed or underway during the year are briefly described in the following paragraphs.

Mt. Hood Highway.—Typical of improvements on the forest highway system was the relocation and surfacing of a 9.3-mile segment of the Mt. Hood Highway

in Oregon, from the Mt. Hood post office south along the East Fork of the Hood River. The old highway, constructed in 1920-24, had a pavement only 16 feet wide, no shoulders, and a very hazardous alinement with 140 curves varying from 10 to 56 degrees. The new route provides improved alinement and a 24-foot width pavement with 4-foot shoulders. This highway, in addition to serving general and recreational traffic requirements, also provides access to excellent stands of timber which can produce an annual sustained yield of 15 million board feet of lumber.

Wasatch National Forest.—Construction was started during the year on a 4.2-mile segment of the Big Cottonwood-Brighton Highway located in the Wasatch National Forest in Salt Lake County, Utah. The $957,504 contract provided for grading and surfacing of a new road through the Big Cottonwood Canyon area, which is used extensively for summer recreation. The snow at Brighton and Solitude also has become an attraction to ski enthusiasts during the winter. The Big Cottonwood area drew 944,000 visitors in 1961. The new 24-foot wide highway, with 4-foot shoulders, will replace an old road of inadequate design which dates back to early pioneer days. Its location along the canyon floor was costly to maintain because of slides within the canyon area. The location and alinement of the new highway is designed to avoid dangerous avalanche areas. The project also will provide 17 parking areas to serve scenic locations and recreational facilities.

Cascade Mountain route.—Work continued during the year on the important North Cross-State Highway across the Cascade Mountains in Washington. This highway, State Route 16, when completed will provide a direct connection

Forest highway funds built this beautiful scenic highway in Oregon, on State Route 35. Majestic Mount Hood rises in the background.

between Interstate 5 (U.S. 99) in the vicinity of Mt. Vernon and U.S. 97 at Okanogan. The present end of the road on the western slope of the Cascades is near Newhalem, and on the eastern slope the road ends at Mazama, leaving a gap of 55 miles between these two points. Public Roads will construct that portion of the gap west of the Cascade Summit with forest highway funds, and the State will construct that portion east of the summit with Federal-aid and State funds. During the past year a $762,000 contract was completed under Public Roads supervision which involved the construction of 2.5 miles of grading and two bridges within this gap. This work and that completed by Public Roads in fiscal year 1961 under an $870,000 contract provided 4 miles of new highway across and beyond Thunder Arm, a portion of Diablo Lake. It also provided a direct road connection to Diablo Dam which previously had been served by a 1,500-foot mechanical lift. The construction of both projects was extremely difficult because of the preponderance of solid rock, and cliffs hundreds of feet high. The project completed this year was accessible by water from Diablo Lake, and Public Roads and the contractor used boats and barges for transportation during much of the construction period. Completion of this highway will provide a much shorter route between the eastern and western portions of northern Washington. It also will tap valuable mineral and timber resources and provide access to one of the most scenic areas in the State.

National park highways, park approach roads, and parkways

Construction or improvement of highways within or approaching national parks or monuments, and of parkways specifically designated by Federal legislation, is financed by funds appropriated to the Department of the Interior. These funds are administered under regulations jointly approved by the Secretary of the Interior and the Secretary of Commerce. Public Roads collaborates with the National Park Service in establishing road systems and developing annual programs. Public Roads engineers make surveys, prepare plans and specifications, and supervise the construction of the major projects on these road systems.

During the fiscal year, improvements were completed on 200 miles of park roads and parkways, involving Federal funds totaling $19.9 million. At the end of the year, additional improvements were underway on 314 miles involving Federal funds totaling $44.9 million. Table 19 of the appendix shows the mileage and general location of Public Roads construction activity for the National Park Service during fiscal year 1962. Some of the improvements are briefly described in the following paragraphs.

Blue Ridge Parkway.—Considerable activity continued during the year on this 477-mile scenic parkway, which extends from the Shenandoah National Park in Virginia to the Great Smoky Mountains National Park in North Carolina. Of its total length, 404 miles were open to traffic, 194 in North Carolina and 210 in Virginia. Construction work was completed during the year on 16 miles, involving Federal funds totaling $3.9 million. At the close of the year additional work involving 84 miles and $14 million was under contract including resurfacing of 23 miles with bituminous concrete. Of particular significance was the awarding of six contracts for construction in the 15-mile section near Roanoke, Va., between U.S. 220 and U.S. 460. Upon completion of this and other work contemplated in this section, the entire length of the parkway in Virginia will be open to traffic. Except for this 15-mile section and a 5.5-mile section near Grandfather Mountain in North Carolina, the parkway is presently open for continuous travel from the Shenandoah National Park to U.S. 70 near Asheville, a distance of 392 miles.

George Washington Memorial Parkway.—During the past year, four projects involving 3.3 miles of construction and Federal funds totaling $3.1 million were

completed on this parkway, which is located on both the Virginia and Maryland sides of the Potomac River near Washington, D.C. At the close of the year six projects were under contract, involving 9.2 miles and $5.2 million of Federal funds. Significant among these were 2.3 miles of paving on the Virginia side of the river from the Central Intelligence Agency building to the Capital Beltway; reconstruction of 3.2 miles of the parkway, also on the Virginia side, to a 4-lane divided standard between the Washington National Airport and the City of Alexandria; and 3.6 miles of grading and surfacing on the Maryland side from the Glen Echo interchange to MacArthur Boulevard, approximately 1.4 miles beyond the Capital Beltway.

Natchez Trace Parkway.—Considerable activity continued on this 450-mile parkway in Alabama, Mississippi, and Tennessee. During the year construction was completed on a total of 42 miles, involving $2.4 million of Federal funds. At the close of the year, 48 miles were under contract for construction involving Federal funds totaling $6.7 million. A major accomplishment of the year was the completion of a 25-mile paving contract in Mississippi. This project and another 27-mile surfacing contract completed shortly after the close of the year made 164 miles of continuous pavement available for traffic in Mississippi, from U.S. 45 near Tupelo to U.S. 51 near Jackson. A total of 226 miles of the parkway are now paved: 176 miles in Mississippi, 6 miles in Alabama, and 44 miles in Tennessee. Another accomplishment of the year was completion of the substructure for the 5,066-foot bridge across the Tennessee River. The superstructure work for this bridge was well underway, and a contract for constructing the concrete deck was awarded near the close of the year. The contracts for these three phases of the work totaled $3.4 million.

Bureau of Land Management roads

Public Roads continued to provide engineering services during the year to the Bureau of Land Management of the Department of the Interior in its program of road construction in Oregon. This included making surveys, preparing plans and specifications, and supervising construction of roads providing access to areas for logging operations. Construction was completed during the year on 129 miles, and involving $4.9 million of Federal funds. At the close of the year 153 miles were under contract for construction at a cost of $6.5 million of Federal funds.

Public Roads also performed necessary maintenance operations for the Bureau of Land Management, as requested, since the roads involved are not on a county or State road system. During the past year, Public Roads maintained 1,142 miles of roads—307 miles constructed under its supervision and 835 miles of feeder roads constructed by others—at a cost of $903,448.

Forest development roads

Public Roads, at the request of the Forest Service, makes surveys, prepares plans and specifications, and supervises construction of roads within national forests which are of primary importance in the protection, administration, and utilization of the forests, or are necessary for the use and development of the resources upon which the communities within or adjacent to the national forests are dependent. Construction under Public Roads direct supervision was completed during the past year on 4 miles of forest development roads, involving Federal funds totaling $512,000. At the close of the year 26 miles were under construction, involving $1.8 million of Federal funds.

Kitt Peak Observatory road

Public Roads completed for the National Science Foundation the construction of a 13-mile access road and parking area to serve the major optical astronomy

observatory at Kitt Peak in the Quinlan Mountains, 40 miles southwest of Tucson, Ariz. The road construction by Public Roads involved grading, draining, and a bituminous surface treatment costing $2.8 million. The observatory, located entirely within the Papago Indian Reservation, is expected to become a major attraction to tourists.

Woodrow Wilson Memorial Bridge

The 5,900-foot Woodrow Wilson Memorial Bridge across the Potomac River south of Washington, D.C., begun in 1958, was substantially completed at the close of the year. Its construction involved 13 contracts costing $12.8 million. The estimated total cost of design, construction, and construction engineering was $14 million. This bridge is a major link in the Capital Beltway, Interstate Route 495. The bridge was opened to traffic on December 28, 1961, and although only a short segment of the Beltway on each side of the river was open for use, traffic volume quickly reached 18,000 vehicles per day. When additional sections of the Beltway are opened in Maryland and Virginia, this bridge will serve as a major bypass of the Washington metropolitan area.

Public lands highways

The Congress authorized $3 million of public lands funds for fiscal year 1963 for the improvement of roads through unappropriated or unreserved public lands, nontaxable Indian lands, or other Federal reservations. Of this amount, $2,853,000 was allotted during the year, on the basis of need, to eight projects. These were selected as having the highest priority among the 46 projects, with an estimated total cost of $35 million, proposed by the State highway departments. The allotments provided $800,000 for continuation of the development of the Richard Sims-Dukes Creek Falls Road in the Chattahoochee National Forest in northeastern Georgia; $350,000 for the continuation of improvements on the Red Lodge-Cooke City Road to provide a suitable northeastern entrance to the Yellowstone National Park in Montana; $500,000 for the continued improvement of New Mexico State Highway 527 leading to the Gila Cliff Dwellings National Monument; $330,000 for further improvement of roads in the Ouachita National Forest in Oklahoma; $300,000 for the improvement of Utah State Highway 15 providing access to the Zion National Park; $200,000 for the continued improvement of Vermont State Highway 9 in the Green Mountain National Forest; $300,000 for the continued improvement of the Mountain View–Lone Tree Road in Wyoming to provide improved access to the Flaming Gorge Dam and Reservoir area; and $73,000 for the strengthening of U.S. 89 in Arizona to provide improved access to the Glen Canyon Dam.

During the year, Public Roads completed three projects under its direct supervision on 66 miles of the Lewis and Clark Highway in Idaho, involving Federal funds totaling $2.6 million of which $1.8 million were public lands funds. At the close of the year another 39-mile Idaho project, similarly supervised, was under contract for $1.3 million which involved $249,000 of public lands funds.

New construction manual

Public Roads, during the past year, completed a new *Manual of Instructions for Construction of Roads and Bridges on Federal Highway Projects*, which was designed for use with Public Roads' *Standard Specifications for Construction of Roads and Bridges on Federal Highway Projects (FP–61)*. The 329-page manual was prepared primarily to provide information and guidance for Public Roads employees engaged in highway and bridge construction performed under

the direct supervision of Public Roads. Its general purpose is to clarify the standard specifications and Public Roads established policies and procedures as related to such work. The manual will be of assistance in standardizing the work and procedures in the various regions.

Highway and Transportation Planning

THE OFFICE OF PLANNING was established in the Bureau of Public Roads on December 6, 1961, to devise, develop, and apply, with the cooperation of other Federal, State, and local agencies, more effective techniques for long-range planning and programing of highway improvements, properly coordinated with other transportation facilities and integrated with comprehensive general planning, so as best to serve and help shape the economic and social development of the Nation and its States and communities. The Office is comprised of four divisions, for national, advance, urban, and current planning, respectively. These divisions were being organized and staffed during the year, in part by transfer of personnel as well as functions from other parts of the headquarters organization.

National planning

On a national basis, the Office of Planning will appraise the role of highway transportation in the emerging patterns of economic, social, and technological development of the Nation and of its regions. This involves estimating the total requirements for transport of people and goods, and the portion of this need that can best be met by highway transportation; determining the capacities and extent of highway systems to serve these needs; and exploring how Federal resources may best be apportioned among the States and highway systems to produce well-integrated Statewide and nationwide highway services. It involves continuing analyses of the costs and benefits of highway transportation to highway users and others, to produce recommendations of fiscal plans to support in equitable manner the needed long-range highway programs.

Advance planning

Public Roads assisted the Highway Research Board in planning and staging a national conference on planning in highway administration, held March 26–27, 1962, in Washington, D.C. The conference sought to define what is needed in planning for solving basic problems of State highway administrators; explored effective ways of using the planning process for realinement of finances and improvement of administration; and identified research needed to improve planning functions.

Recognizing a growing interest in the need for systematic construction programing, Public Roads cooperated with the Highway Research Board committee on highway programing in an inventory of programing procedures in several States. This activity was the outgrowth of about 5 years of preliminary study of the subject. Its objective is to determine by an evaluation of present methods or procedures those factors or features that may form the basis for sound advance programing methods. From preliminary analysis, it is believed that three or four methods may be developed and suggested to the States as guides for improving existing procedures.

Public Roads was working closely with State highway departments to aid them in estimating their long-range highway needs—20 or more years ahead—taking full account of economic, social, and technological trends developed on a national basis and geared to the particular potentials and changing character

of economic and population growth and distribution in the individual States. Through such needs studies, realistic plans for the several highway systems are developed, consistent with available and prospective revenues; and progressive priority programs of construction projects 5 or more years ahead are prepared to bring about orderly attainment of the long-range plans. These priority programs must take into account the relative needs of the various systems and their segments, based on present adequacy and immediacy of future need. They must differentiate between the urgency of urban as against rural improvements and the relative order of importance of needs in one urban area as against another, as well as establish priorities among various classes of improvements within urban areas, such as expressways or major street improvements.

Public Roads personnel during the year aided 13 States in studies of programing, scheduling, and sufficiency rating procedures, manpower needs, construction planning and programing methods, and highway needs.

Public Roads personnel continued to advise and assist the National Association of County Engineers in the work of its committee on programs, plans, and construction, and its committee on research.

The first steps were taken in a proposed study leading to systematic scheduling methods for Interstate System construction projects. This study will furnish a basis for the development of road logs for sections of the Interstate System, which will show pertinent geometrics as well as programing and status features. The log also may be collated with information obtained in the Interstate cost estimate study for use in the development and scheduling of Interstate construction programs.

Urban planning

In carrying out its planning function in urban or metropolitan areas, Public Roads continued to work through the State highway departments with metropolitan and urban agencies in developing long-range plans and programs for highway transportation, properly coordinated with other forms of transportation and so integrated with the comprehensive plans for the area as to serve its future transportation needs and help shape its growth along the lines desired by its citizens. Public Roads was also working in close harmony with other Federal agencies, particularly the Housing and Home Finance Agency, to ensure that all types of Federal planning assistance are well coordinated in any urban or metropolitan area.

In addition, Public Roads continued its work in research, development, and application of techniques to estimate the distribution of future travel by highway and transit, the transportation requirements of various land uses, the influence of various forms of transportation on land use, and the interaction between the two. Also involved is the coordination of highway improvements with parking and traffic control programs. Such work requires recognition of the social as well as the economic impact of highway transportation, its effect on community values, and the importance of aesthetic considerations. These efforts involve working with all agencies concerned with each area in the development of coordinated programs of capital expenditure and operational practices, to bring about the desired overall community objective.

Public Roads continued to increase its efforts to encourage cooperative comprehensive transportation planning properly integrated with land-use and development planning in urban areas. Of particular significance was a report to the President on urban transportation prepared jointly with the Housing and Home Finance Agency, described elsewhere in this report.

During the year Public Roads provided continuing assistance to the joint committee on highways of the American Association of State Highway Officials

and the American Municipal Association, and to the AASHO urban transportation planning committee. Advisory staff assistance also was provided to the highway committee of the American Municipal Association and the suburban committee of the National Association of County Engineers.

Public Roads endorsed and was actively supporting an Action Program to promote cooperative urban transportation planning and the development of implementation programs, which was jointly initiated during the year by the American Association of State Highway Officials, the American Municipal Association, and the National Association of County Officials. The Action Program was being directed initially at cities having populations of 50,000 to 250,000. Public Roads assisted in organizing regional meetings to stimulate interest on the part of local officials, and was providing technical assistance to pilot studies initiated in selected cities to demonstrate organizational and technical procedures.

Concentrated training courses were being conducted by Public Roads for its own and State highway department professional personnel on the latest techniques used in urban transportation planning. The initial training effort consisted of two 2-week courses covering traffic assignment and forecasting with particular emphasis on practical application of techniques using electronic computers. The training program included discussions of the elements of the urban transportation planning process such as transportation, land use, socio-economic aspects, etc., and detailed instruction on inventories, data analysis, traffic assignment, trip generation, forecasting, modes of travel, trip distribution by both growth-factor and mathematical-model techniques, determination of future travel demands, and the preparation and evaluation of alternate plans. These courses were scheduled to be repeated every 4 months. Technical assistance also was provided to individual States.

Comprehensive transportation planning studies were started with Public Roads cooperation in 16 cities, bringing the total of such studies to 186, of which 30 are repeat surveys. Studies were underway in 55 urban areas. Of special note was the study undertaken in the New York metropolitan area of New York, New Jersey, and Connecticut, the Nation's largest urban complex. The Governors of the three States, at a joint meeting on August 30, 1961, established the Tri-State Transportation Committee with the responsibility of conducting a broad-scale examination of the problem and making recommendations for meeting the region's immediate and long-term transportation needs. Continuing transportation planning studies were in progress in Chicago, Detroit, Minneapolis-St. Paul, Pittsburgh, and Washington, D.C. In addition to such comprehensive studies, several cordon-type roadside interview studies were conducted in smaller cities and six parking studies were completed or initiated during the year.

Cooperation with the Housing and Home Finance Agency continued through regular meetings of joint committees both in Washington and in the regional offices. Each agency keeps the other informed of its programs, and their regional joint committees have actively encouraged the State highway departments and State planning agencies to coordinate their urban planning programs. Joint financing was established in 9 planning studies during the fiscal year, bringing the total of such cooperatively financed studies to 19.

Electronic computer programs developed for the assignment of traffic to an urban highway network were improved and converted, with the cooperation of other agencies, to a faster computer, decreasing the computer running time by one-fifth. An intermediate computer monitoring system was developed for these and other programs, eliminating the need for human monitoring. Several additional computer programs were written to edit and summarize origin and

destination survey cards. The editing programs rearrange the data in a standard output format for summary and other processing. An analytical procedure was being developed to delineate route locations from future travel desires in an urban area, providing greater refinement in determining route locations.

Plans were being made to improve upon and also to develop new techniques, using electronic computers, for urban transportation planning processes and for evaluating a transportation plan by 5-year increments.

Urban planning research

Public Roads' urban planning research during the year was directed toward the continuing development of basic data, techniques, and procedures for a rational process of comprehensive urban transportation planning, in particular those related to estimating the future travel demands of our increasing urban population. Carrying out these functions will require the development and improvement of data-collecting and planning techniques through the application of modern statistical methods, full utilization of high-speed data processing equipment, and the design, testing, and use of mathematical models wherever possible. The introduction of new engineering skills and of disciplines not heretofore generally associated with transportation—for example, that of the geographer and the sociologist—as well as that of the economist and planner, will be needed. The gap between the conceptual approach of the city and metropolitan area planners and the quantitative approach of the highway planner must be bridged.

Public Roads and the Pennsylvania Department of Highways continued a cooperative study aimed at testing and evaluating mathematical models or formulas to simulate urban trip interchanges. The trip interchanges determined by the various models will be compared with known trip interchanges as determined by actual origin-destination studies. This should allow conclusions to be reached about the reliability of the several models now in use in the field. Three separate models are under study—the "gravity" model, the "opportunity" model, and the "competing-opportunities" model. The gravity model distributes trips produced in one zone to another zone in accordance with some measure of the relative trip drawing force of the second zone, such as number of employees, and the relative spatial separation of the two zones, such as the travel time between zones. The opportunity model distributes trips on the theory that each zone has a stated probability of being acceptable as a destination for work, shopping, etc., and that people want their trips to be as short as possible. The probability that a zone is acceptable is proportional to the size of the zone and inversely proportional to the trips which have not yet found a desired destination. The competing-opportunities model theorizes that only zones within specified time limits of travel compete for trips from all other zones, and these zones compete in accordance with the size of the zone.

Another Public Roads research project was concerned with testing the effectiveness of the gravity model to forecast future travel. A gravity model was being developed, using 1948 data from the Washington Metropolitan Area Transportation Study and estimating trips for 1955. These estimated trips will be compared with known trips reported by a 1955 study.

In still another project underway, Public Roads sought to develop electronic computer programs for use in forecasting future travel. Programs were developed during the year to tabulate and determine information used in the gravity model method of forecasting traffic.

A study sponsored by Public Roads at the University of North Carolina was concerned with the identification and quantification of the key factors that influence the location, amount, type, and intensity of urban residential land

development. A land development model will be formulated that may make possible an analytical approach to forecasting urban residential land development.

A project underway at the University of Pennsylvania with Public Roads cooperation involves the investigation of the length of urban trips classified according to location and type of land-use activity at trip origin and destination, trip purpose, and mode of travel. Length is measured in terms of over-the-road distance, airline distance, travel time, and travel cost.

The University of Arkansas was conducting a study for Public Roads, leading to the development and establishment of more effective guidelines and procedures for coordinating transportation and urban planning in small cities and the means for implementing them.

Current planning activities

The State highway departments, with Public Roads cooperation, continued a variety of current highway planning survey activities. Road inventory information on rural roads and main city streets was updated in 46 States and Puerto Rio during the year. The data thus obtained are used for determining needs and deficiencies of the highway network in each State. Some 390 county highway maps were completed by 35 States. Also completed were 19 State highway maps, 34 State traffic maps, 283 county traffic maps, and 1,434 maps of cities and incorporated places.

Bridge records and index maps were being revised on a continuing basis as a defense requirement. These records reflect limitations of all routes that may be used for defense shipments or for movement of troops or military equipment during emergencies; they also are used for tactical planning.

The comprehensive inventory of the Interstate System traveled way was continued, with many States completing the first year's study. Analysis of the data on a nationwide basis was underway.

Traffic data from more than 1,800 continuous traffic count stations were analyzed during the year to develop trends in highway traffic volumes. Highway travel on all roads and streets increased by 2.6 percent during the year. The travel increase on rural roads was also 2.6 percent, compared to 2.5 percent on city streets.

In the continuing effort to improve the accuracy of estimates of traffic volumes, additional data were amassed in the study of reliability of the annual rate of change of traffic volumes on rural roads as determined by data from continuous-count traffic recorders. Traffic counting in urban areas was further extended. Special emphasis was placed on the means of obtaining comparative measures of traffic volumes along the Interstate System to determine traffic growth on the routes with respect to the corridors in which they lie. Frequency distribution analyses were made of hourly traffic volumes at selected continuous-count stations grouped according to highway system, average daily traffic, number of lanes, and direction of travel. Hourly volumes expressed as a percentage of average daily traffic, and the frequency of occurrence of these volumes, will be correlated with speed data for motor-fuel consumption studies. In one State a reduction of two-thirds of effort in editing traffic-count field reports was achieved by the installation of quality control methods, utilizing a computer.

Manual vehicle classification counts conducted in 33 States indicated that 9.8 percent of all passenger-car travel was by vehicles smaller than the "standard" American passenger car. In all but 5 States, compact cars comprised a greater proportion of the out-of-State passenger cars than they did of the in-State passenger cars.

Motor-vehicle-use studies

Analyses of the data collected in Statewide interview studies of the characteristics of motor-vehicle ownership and use, which were conducted in 24 States since 1951, were completed in 22 States. These have been supplemented with nationwide data on motor-vehicle ownership and travel characteristics collected during the fall of 1959 and the spring of 1961 by the Bureau of the Census for Public Roads. The information available from the two types of studies was being synthesized and summarized by the Public Roads research staff.

From the census study it was possible to develop motor-vehicle travel patterns by day of the week. Although the greatest percentage of automobile trips was customarily made on Saturdays, the greatest percentage of average automobile travel was generated on Sunday trips. Saturday trips accounted for 15 percent of the trips made during the average week and 16 percent of the travel; the average weekday—Monday through Friday—accounted for about 14 percent of the trips and 13 percent of the travel; the average Sunday accounted for only 13 percent of the trips but generated 17 percent of the travel. For Monday through Friday the average length of trip was from 7.0 to 7.8 miles; for Saturday, 8.3 miles; for Sunday, 10.6 miles.

Certain types of travel, such as from home to work, were concentrated primarily during weekdays; other types, such as shopping and family business, were concentrated on Saturdays; while others, such as trips for educational, civic, religious, social, and recreational purposes, were concentrated on Sunday. In some instances, these concentrations were rather striking. Trips to work represented from 16 to 20 percent of all trips made on weekdays, but only 9 percent on Saturdays and less than 3 percent on Sundays. More than 28 percent of all shopping trips were made on Saturdays; the weekday percentages varied from a low of 11 percent on Tuesday and Wednesday to a high of nearly 20 percent on Friday; and less than 5 percent were on Sundays. The percentage of trips for social and recreational purposes was lowest on Mondays and Tuesdays, when it was about 9 percent; gradually built up to 13 percent on Fridays; and reached 21 percent on Saturdays and 28 percent on Sundays. The influence of school and church on the driving habits of American families was reflected in the distribution of trips for educational, civic, and religious purposes: Less than 6 percent of such trips were made on Saturdays; the weekday average was from 10 to 13 percent; and 38 percent of such trips was made on Sundays.

Highway Design

Public Roads continued its close collaboration with the State highway departments in evolving suitable geometric and structural highway designs, particularly for freeways in urban and suburban areas where the situation is often complex because of large traffic volumes, costly right-of-way, and the need for providing both local and through service. The State highway departments were emphasizing the selection of appropriate interchange designs properly spaced to provide safe operation, to avoid excessive costs, and to accommodate the expected future traffic volumes.

In rural areas there was an increasing use of independent roadway design in which each of the two roadways of a divided highway is designed as a separate unit, resulting in variable widths of median areas and variations in the adjacent grades. This concept, when properly applied in rural areas having rolling or hilly terrain, often provides a safer and more attractive highway at no extra cost. An Interstate System route of this type in Maine received nationwide attention as a prize-winning example of a high-type, pleasant-to-view highway.

Emphasis was being placed on the relationship of geometric design to and its suitability for clear, lucid signing and marking. On high-type highways there was a trend toward the use of full-width paved shoulders of contrasting texture and color; speed-change lanes of a more tapered design; and interchanges that avoid major weaving movements across the through traffic lanes. As substantial-length sections of Interstate highways were opened to traffic the operational functioning of their location and design details were being checked in detail, to ensure that the planned concepts of efficiency, safety, and ease of traffic operation were being attained.

As noted elsewhere in this report, all highway agencies—State, city, and county—were being urged to put into effect the standards of the new *Manual on Uniform Traffic Control Devices* and to engage in a program to attain better, modern traffic-control devices on all highways by 1966. Public Roads was assisting in all respects in such a program, including approval of Federal-aid financing of projects for such modernization on the Federal-aid systems. Particularly on the Interstate System, the need for and placement of signs was being treated as an integral part of highway design.

Design standards, policies, and guides

Public Roads engineers continued cooperative assistance to committees of the American Association of State Highway Officials in the development of design standards, guides, and policies. During the year AASHO completed and published *An Informational Guide on Air Rights Above and Below Interstate Highways*, which outlined the conditions under which there might be use of the space above a depressed or below an elevated section of Interstate highway. However, the guide was withdrawn by AASHO in June 1962 after issuance of a Public Roads administrative statement, based on the AASHO policy, which specified the conditions for Federal approval of airspace use.

During the year the AASHO *Informational Guide on Services to Motorists on Interstate Highways* was completed and published. This guide reviews the problems of the State highway departments that have been found to be inherent in the operation of long stretches of Interstate highways open to traffic, with regard to normal services and emergency assistance for motorists and vehicles and to freeway patrolling by police and maintenance vehicles. A major suggestion made is that the State highway departments establish units or officials with responsibility for the coordination needed to resolve such problems.

Also completed and issued was the AASHO *Policy on Uniform Distress Signals for Motorists on Freeways*. AASHO acted to give national recognition to the hood-up, white-cloth-on-side distress signal, together with other safety procedures to follow when a vehicle has to stop on a freeway.

During the year AASHO completed and adopted *Geometric Design Standards for Highways Other Than Freeways*. This superseded previous AASHO standards for primary and secondary highways. The new standards incorporate several changes, including a new height criterion for measurement of sight distance and upgraded dimensions for low-volume roads, that are expected to improve highway safety. Work was completed on a *Guide for Roadside Telephones and Emergency Communication Devices for Motorists on Interstate Freeways*, which outlines the general conditions under which public pay telephones and emergency calling devices might be considered for installation along Interstate highways. Experience thus far is not sufficient to lead to a more definite policy or standards.

Work was continued on studies leading toward guides on control of headlight glare on divided highways and on design of crossroads near freeway interchanges, although available data and experience as yet do not point to definitive

conclusions. Studies were started on the problems of geometric and structural design of frontage roads.

Using the tremendous amount of data made available through the AASHO Road Test, a guide procedure for the design of flexible pavements for highways was developed by the AASHO committee on design. The guide was approved by AASHO and is now in trial use by the State highway departments. This document for the first time provides adequate tools for designing a flexible pavement, taking into account the many existing variables and assigning a value to each to arrive at a total surface design commensurate with the number and weight of wheel-load applications anticipated. The guide has been widely acclaimed for its value to highway designers.

Bridge Design

Close cooperation continued between Public Roads and the States in the planning and construction of highway bridges in the Federal-aid program, and furnished technical assistance on bridge planning and construction for the Inter-American Highway and to three other foreign countries.

A number of noteworthy bridges were in the design or construction stages in the Federal-aid program. An 8-lane, 127-foot wide deck plate-girder bridge over the Rouge River in Detroit, Mich., will be 8,627 feet long, with the main structure over the river consisting of 225, 300, and 225-foot continuous spans. A 6-lane bridge over the Schuylkill River at Girard Point in Philadelphia, Pa., will have a length of 9,716 feet of which 2,700 feet will be beam spans; 3,536 feet, plate-girder spans; and 2,480 feet, truss spans. The 3-span continuous truss structure over the river will have span lengths of 340, 700, and 340 feet. The Tanana River Bridge near Nenana, Alaska, will consist of two 500-foot simple through-truss spans and a 90-foot end span, with a 30-foot roadway.

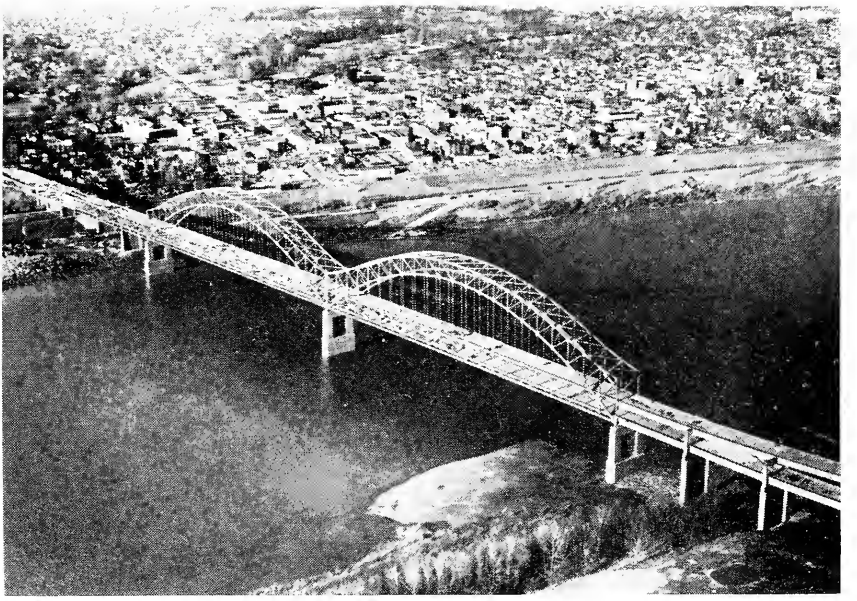
The Philippine Republic, in the previous year, had obtained a World Bank loan of which $9 million was earmarked for bridge material and equipment. Public Roads was requested to procure this material. Bids were received and evaluated and contracts were awarded to fabricators in this country and Great Britain. Public Roads was checking shop drawings and making shop inspections.

Public Roads completed work on an enlarged and revised edition of its publication, *Standard Plans for Highway Bridge Superstructures.* The new standard plans will be printed in four separate parts: concrete superstructures, standard steel superstructures, timber bridges, and typical continuous bridges. In connection with this work two electronic computer design programs were prepared, one for composite I-beam bridges and one for noncomposite welded plate-girder bridges.

A draft of a highway bridge construction manual was developed by Public Roads for the operating committee on bridges and structures of the American Association of State Highway Officials.

A Public Roads publication, *Design Charts for Open-Channel Flow,* was completed and printed. Several hydraulic engineering circulars, including one on hydraulic charts for the selection of highway culverts and one on design of roadside drainage channels, also were prepared and distributed. Seminars on hydraulic problems related to highways were conducted in four regional field offices in cooperation with the State highway departments for the purpose of training personnel and promoting good drainage design.

Work was continued on studies of the use of two new steels which will bring economies in Federal-aid bridge construction. The American Society for Testing and Materials specifications for heat-treated alloy steels with yield point values of 90,000–100,000 p.s.i. were promoted to final acceptance in cooperation



This two-span, double-deck steel-arch bridge carries Interstate Route 64 across the Ohio River, connecting Louisville and New Albany. Built jointly by Indiana and Kentucky, the bridge and its approaches cost $12 million. At the close of the fiscal year the upper deck was still under construction. The lower deck was in use and had already greatly relieved traffic congestion in the area. This bridge won a national award as the most beautiful structure in its class.

with steel producers and consumers. A new structural steel specification requiring improved chemical controls was developed to provide steel acceptable for both riveted and welded bridges. This specification will provide a steel of higher yield strength than the old structural carbon steels, permitting higher working stresses and substantial savings since it will cost about the same as the lowest price structural steel now used. It also will simplify steel construction practices by eliminating two current grades of steel.

Increased use of aluminum in highway construction required coordination by Public Roads of the materials appropriate for various applications. A listing of suitable alloys was prepared in cooperation with industry and Government agencies.

A proposed specification for the design of bridge railings was presented to the American Association of State Highway Officials for study.

Research was underway in cooperation with the Reinforced Concrete Research Council and Cornell University to increase tensile working stresses of high strength reenforcement without abnormal cracking or jeopardizing the integrity of reinforced concrete structures.

Public Roads continued participation with the Portland Cement Association and several State highway departments in a cooperative investigation of reinforced concrete bridge decks to determine the causes and extent of deck deterioration and to find means of improving service life on future construction.

Other bridge research is described elsewhere in this report.

These two pairs of twin bridges on Interstate Route 90 in Wisconsin illustrate both the functional grace and the diversity of design with which bridge builders fit structures to location needs. The girder bridges supported on piers cross the Wisconsin River; the steel arches span Mirror Lake near the Wisconsin Dells. These bridges are part of a 55-mile, $32 million section of Interstate 90 between Madison and the Dells, opened to traffic in October 1961.

Right-of-Way Acquisition

DURING THE YEAR virtually all State highway departments adopted revisions in their organizations, policies, and procedures in the acquisition of highway right-of-way for Federal-aid highway projects. The changes reflected a steady overall improvement in right-of-way administration. Most States had developed right-of-way manuals to increase the quality and uniformity of their operation. With the cooperation of Public Roads many States also established or improved their property management operations.

Procedures were instituted for inspections in depth of right-of-way operations, designed to assure that the State highway organizations are making full use of all essential improvements in procedures and to uncover and correct deficiencies in State right-of-way operations.

To satisfy the need for appraisers and other right-of-way personnel, Public Roads assisted the State highway departments in intensive training programs. This subject and right-of-way research are discussed elsewhere in this report.

Use of Air Space on the Interstate System

PURSUANT TO AUTHORITY granted by Congress in the Federal-Aid Highway Act of 1961, Public Roads issued standards to guide the State highway departments in allowing use of air space on the Interstate System. The use of space above and beneath urban freeways for commercial or residential purposes, in addition to parking, is considered to be one possible answer to problems faced by the cities as a result of the need for developable land, the displacement of people by highway construction, and the conversion of land use to highways.

Public Roads standards on air space usage are aimed primarily at preventing any interference with the full use and safety of the Interstate highways, and each proposal for such use must be approved by the Federal Highway Administrator. Federal-aid highway funds may not be used to pay for any additional

Municipal parking facilities established by the city under twin viaducts carrying Interstate Route 4 in Orlando, Fla., have greatly relieved the downtown parking problem. Federal-aid funds may not be used for such facilities, but Public Roads encourages use of airspace above or below Interstate highways.

highway costs occasioned by authorized air space use. On the other hand, disposition of any income resulting from use of Interstate highway air space is left to the State.

Control of Outdoor Advertising on the Interstate System

CONGRESS DECLARED in the Federal-Aid Highway Act of 1958 that it is in the public interest to encourage and assist the States in controlling outdoor advertising along the Interstate System. Any State entering into an agreement with the Secretary of Commerce by June 30, 1963, to regulate outdoor advertising will receive an additional one-half of 1 percent in the Federal share of the cost of Interstate projects affected. Vermont entered into such an agreement during the fiscal year, bringing the total number of States that have done so to 16. Judging from the widespread interest shown in this matter, it is expected that appropriate enabling legislation to control outdoor advertising will be considered in many of the State legislatures at their 1963 sessions.

Navigational Clearance Requirements

DURING THE YEAR Public Roads continued its efforts to obtain greater recognition of highway transportation needs in the planning and management of water resources development projects. A major accomplishment of the year was the development and issuance by the U.S. Corps of Engineers of a revised regulation covering the economic analysis methods to be used in determining vertical navigation clearances. This manual should result in the establishment of vertical bridge clearances that are in the best interest of the Nation as a whole.

Another accomplishment was the obtaining of recognition by the several water resources development agencies of the necessity of considering, in the economic analysis of water resources development projects, the increase in highway transportation costs brought about by water resources developments; and the necessity of providing for advance participation by the water resources development agencies in the construction or reconstruction of transportation facilities that traverse areas needed for future water resources development projects.

Highway Roadside Development

PUBLIC ROADS CONTINUED its cooperation with committees of the American Association of State Highway Officials in the preparation of a landscape design guide to assist the States in applying the AASHO *Policy on Landscape Development*, with emphasis on functional planting in urban areas.

Cooperative work was continued with State highway departments and industry toward the improvement of materials and methods for preventing or reducing soil erosion. Field demonstrations of new materials produced by the paper, fabric, and milling industries, and the application of seed by airplane, offered possibilities. Under cooperative agreements with 14 State highway departments, special studies were continued on the control of erosion, roadside planting for snow control, environmental requirements of plants, and roadside mowing practices.

Use of Aerial Surveys

IN-SERVICE TRAINING in the principles and procedures of using aerial surveys was given to engineers from the States, other countries, and field offices of Public Roads. Two special schools and three 1-week courses were conducted.

Consultation service was furnished as requested by the States and other countries in the preparation of detailed specifications for and cost estimates of making aerial surveys for highway location and design purposes, and in providing specific data on potential borrow sites for suitable subgrade materials. Aerial survey data were provided to assist in locating a 60-mile Interstate project.

Aerial photographic interpretation surveys using aerial color photography were being used increasingly to determine soil and ground conditions and to locate sources of highway construction materials.

Highway Needs of the National Defense

CLOSE COORDINATION continued between Public Roads and defense agencies relative to matters of joint interest. During the year, with the cooperation and on behalf of the Department of Defense, the selection of Interstate routes to be developed with 16-foot vertical clearance around large urban areas and connectors between Interstate routes and major port areas was substantially completed. Numerous analyses were made for the Department of Defense on such problems as the transportability of special military vehicles such as the Minuteman transporter-erector, and the capability of existing routes and the construction of special routes to carry oversize, overweight vehicles.

Coordination with defense agencies also was continued in plans for operational readiness throughout the highway field to meet a national emergency.

Defense access, replacement, and maneuver roads

Public Roads and State and local highway departments continued to cooperate in providing adequate highways to service defense installations and activities. Funds for those improvements that cannot be appropriately financed under the regular highway programs are transferred to Public Roads by defense agencies. Both engineering and construction usually are handled by highway departments under the same procedures as regular Federal-aid highway programs.

During the fiscal year, funds transferred by the Department of Defense included $1,470,385 from the Department of the Army, $1,610,000 from the Department of the Navy, and $9,185,766 from the Department of the Air Force, a total of $12,266,151. The Atomic Energy Commission also transferred $917,000 to finance one project and the National Aeronautics and Space Administration transferred $210,000 to finance two projects.

During the year 75 projects serving defense installations were completely financed at a total cost of $15.6 million, financed from funds transferred by the Department of Defense, AEC, and NASA. At the close of the year, preliminary engineering costing $444,035 and right-of-way acquisition costing $63,058 were programed on three additional defense projects. These projects had a total estimated cost of $10.4 million, of which $8.3 million are access funds. Five other projects were certified as important to the national defense, requiring an additional $5.1 million of defense access-road funds to complete the financing. Projects having a total estimated cost of $19.6 million and requiring $17.3 million of defense access-road funds were awaiting certification by the Department of Defense. Projects having a total estimated cost of $1.0 million and requiring $863,000 of access funds had also been referred to NASA. Additional projects were being evaluated by Public Roads.

During the year construction of access roads serving Atlas and Titan ICBM sites in the vicinity of 12 air bases was substantially completed. Access roads to such installations have been completed at 17 air bases in 20 State and involved 101 projects having a length of 237 miles and costing $10.9 million. Public Roads continued to handle a large volume of work for the Department

of Defense in connection with Minuteman missile installations. Condition surveys were completed for 3,199 miles of roads expected to be used as haul roads by contractors constructing installations at Ellsworth, Minot, and Whiteman Air Force Bases. Two high priority defense projects providing for low-type improvement of 511 miles of public highways at a cost of $1.4 million, to serve contractors' heavy hauling requirements, were completed at Minot and Whiteman Air Force Bases within a few months after being requested by the Department of Defense. Construction of permanent improvements on 1,637 miles of roads to serve operational needs of sites at Malmstrom, Ellsworth, and Minot Air Force Bases was started. These were estimated to cost $10.6 million. An additional $1.5 million was programed for the complex at Whiteman Air Force Base for preliminary engineering, right-of-way, and some construction. Estimates were prepared of the cost of improving roads to meet site contractors' heavy hauling needs and of operational needs of additional Minuteman installations at five air bases. Public Roads engineers assisted in site feasibility studies for Minuteman wings at locations in 15 States, making available their knowledge of local road conditions and their technical competence.

Condition surveys prior to military maneuvers were made of State and local roads in the Peason Ridge Artillery Range and the Kisatchie National Forest in Louisiana. They will be used as the basis for road restoration upon termination of maneuvers staged by an Armored Division of 20,000 men. Prior to maneuvers, 21 bridges were strengthened to a 60-ton capacity at a total cost of $89,324.

Emergency planning and mobilization readiness

Effective August 1, 1961, Executive Order 10952 assigned to the Department of Defense certain important civil defense activities, formerly the responsibility of the Office of Civil and Defense Mobilization. Subsequently, the name of OCDM was changed to the Office of Emergency Planning, and delineation of the respective responsibilities of these two agencies ensued.

On February 16, 1962, Executive Order 10999 assigned emergency preparedness functions to the Secretary of Commerce. The new Executive Order made very little substantive change in Public Roads' planning and preparedness responsibilities and operations. Public Roads therefore was able to continue with little change the program of emergency readiness in which it had already been engaged in cooperation with the State highway departments.

With the continuing support of the American Association of State Highway Officials, a number of State highway departments made good progress in clarifying their emergency responsibilities by modernization of State operational survival plans.

The attainment of essential capability in radiological monitoring for the protection of the public traveling on highways in event of enemy attack received continuing attention. All Public Roads offices had some trained monitors and the highway departments had more than 17,000 trained monitors. All but six State highway departments had initiated such training, and the remainder were planning to do so. More monitors will be given initial training in the coming year, and refresher training courses will be given.

During the year, Public Roads developed a briefing program on survival in the event of an enemy nuclear attack. The program was made available to all Public Roads offices and to the State highway departments. Nearly all employees of Public Roads had an opportunity to hear these talks, and a number of State highway departments have used the material for the instruction of their own employees.

Highway Safety

RECOGNIZING THE URGENT NEED to intensify and expand traffic accident prevention programs throughout the United States, Public Roads established an Office of Highway Safety on December 6, 1961. Its specific responsibilities include maintaining liaison with key highway safety officials and organizations, both public and private, and aiding them in promoting sound and balanced programs which will assure steady gains in highway safety; promoting the development and improvement of highway safety standards; gaining active public support for needed highway safety measures; and coordinating the application of results of all public and private research in the highway safety field.

Highway safety coordination

A Highway Safety Coordination Division was being organized at the end of the fiscal year as one of two major units of the Office of Highway Safety. Its branches will deal with the traditional areas of highway safety—education, enforcement, and engineering. In addition, the division furnishes staff services to the President's Committee for Traffic Safety and to the Interdepartmental Highway Safety Board.

The activation of the Interdepartmental Highway Safety Board was a major development during the year, and gives leadership for a national highway safety program. This Board, established by Executive Order of the President, is comprised of the heads of seven Federal agencies: the Commerce, Defense, Health, Education, and Welfare, Labor, and Post Office Departments, the General Services Administration, and the Interstate Commerce Commission. The Secretary of Commerce serves as chairman. The Board met for the first time in June 1962. Public Roads will furnish technical and clerical staff assistance to the Board and its working committees.

The President's Committee for Traffic Safety, charged with the task of mobilizing public support for its Action Program, was served by Public Roads in a number of ways during the year. Under Federal legislation, up to $150,000 of Public Roads administrative funds may be used annually in advancing the Action Program for highway safety. Public Roads provides technical and clerical staff, advice, and guidance to the Committee.

Public Roads, through cooperative project grants, supported work in a number of areas of safety during the year on such subjects as uniformity of traffic laws, correlation of traffic safety research, improvement of traffic court procedures, and improvement of motor-vehicle administration. In each of these areas, a going program was assisted in preference to the establishment of a competing or duplicating program.

Much of the research described elsewhere in this report is directly or indirectly related to highway safety.

National Driver Register

The National Driver Register Service, which began operation on July 1, 1961, is a voluntary, cooperative Federal-State driver record exchange on individuals whose driving privileges have been withdrawn for driving while intoxicated or for involvement in a traffic fatality. By the end of the year 51 States and Territories were participating by furnishing information to Public Roads on such drivers. More than 180,000 records were accumulated during the fiscal year, and over 4,000 of the drivers reported on were found already to have a violation record in another State. More than 240,000 searches were made at the request of the States, as checks against new license applications. These searches resulted in identification of almost 1,700 drivers with records in the Register.

The Driver Register converts all media of data transmission, including manually prepared forms, punch cards, punched paper tape, and magnetic tape, to a format for use in the Public Roads electronic computer system. Inquiries received during each day are converted to computer format, processed during the night, and replies are returned to the States by air mail the following day. This service enables the States to issue licenses without delay, while ensuring that unsafe drivers do not continue to drive on the Nation's highways through evasion of the safety provisions in State driver license laws. Identification techniques developed and adapted for electronic searching permit matching names with considerable variations in spelling and completeness. A planned delayed-search technique has identified many drivers who attempted to obtain a license in another State after arrest but before conviction in order to technically avoid perjury.

The original Driver Register legislation was technically amended by Congress during the year, to enable additional States to participate in the program. The law now covers suspensions as well as revocations of drivers' licenses.

Manual on Uniform Traffic Control Devices

Publication by Public Roads of the 1961 revised *Manual on Uniform Traffic Control Devices for Streets and Highways* gave new impetus to the standardization of signs, signals, and pavement markings on American highways, particularly on the Federal-aid systems where Public Roads concurrence is required for all such devices. Early in 1962 a series of 13 regional meetings was sponsored by Public Roads in cooperation with the State highway departments and other agencies to publicize and promote the use of the manual by State and local authorities. Nationwide uniformity in the design and use of traffic control devices will do much to improve highway safety.

Administration and Management

Organization

THE ADMINISTRATION AND MANAGEMENT of Public Roads operations and responsibilities were further improved by a reorganization of the Washington office effected during the fiscal year. Two new primary units were established in the Washington headquarters—an Office of Planning and an Office of Highway Safety—with corresponding realinement of various functions in the headquarters organization. The Office of Planning will concentrate attention on the growing need for systematic current and long-range planning and programing in highway development. The Office of Highway Safety will coordinate efforts of governmental and private agencies to alleviate the serious problem of accidents on the Nation's highways. The work of both of these offices is further discussed in other sections of this report.

During the year the automatic data processing (ADP) operation was raised from branch to division level. Its responsibilities include establishing a master plan for an adequate ADP program, developing a basic system within the framework of the master plan, and providing systems analysis and design services to achieve better integration of program objectives and optimum use of ADP facilities.

Manpower utilization and needs

A manpower utilization committee composed of capable Public Roads field engineers completed an extensive and critical appraisal of engineering manpower efficiency and needs in the Bureau's field offices. The committee made specific recommendations for more effective use of engineering manpower and im-

proved management practices in Public Roads. Considerable progress was made in implementing the committee's recommendations.

One of Public Roads' most complex management problems has been the ever-widening gap between workload and engineering manpower that has been developing since the expanded Federal-aid program began in 1956. The committee developed an empirical formula relating workload to engineer staffing needs, which was being used to evaluate the number of engineer positions needed for the field operations.

Financial management

Public Roads' financial management structure consists of three principal elements—finance, budget and management, and program analysis—which support and complement the development and execution of the Bureau's technical programs. Considerable operational improvement was made during the fiscal year in these areas.

The program analysis division was reconstituted to provide more effective coordination of the "managerial accounting" program for reporting, analyzing, and forecasting financial trends of the Federal-aid and other highway programs. Centralization of Federal-aid construction allotments was accomplished in 1962, reducing the document flow between field and Washington offices and increasing efficiency in reporting the status of Federal-aid construction funds. Procedures for handling program analysis data were improved and simplified, and various field reports that provide source information were revised to permit more adaptability to and better use of high-speed automatic data processing equipment.

Public Roads initiated a procedure for handling all of the financing of its work for the Agency for International Development on a reimbursable basis rather than by appropriation account transfers, thereby eliminating a great deal of clerical detail and paperwork.

Specific procedures were established for long-range budget and manpower programing, which will serve as the framework for formulation of budget estimates for a 5-year period beginning with fiscal year 1964. The advance planning procedures involve forward budget projections to provide more accurate forecasts of needs and better planning of manpower and resources utilization.

Using the automatic data processing personnel accounting system, costs for personnel compensation and benefits were being projected into future budgetary periods, thus providing accurate control of funds on a current basis and permitting centralized allotment of these costs. The procedure eliminated a considerable volume of paperwork and accounting processes in the regional and headquarters offices.

Centralization of the administrative payroll for the four Public Roads western regions was accomplished during the year through the use of advanced computer facilities, and resulted in more efficient preparation of reports on various payroll deductions. This centralization also made it possible to institute a pilot procedure for streamlining accounting procedures relating to distribution of administrative employee time, thus ensuring proper distribution of administrative costs between Federal-aid and other programs.

During the year continuing emphasis was placed on the cooperative program for financial management improvement in State highway departments. Nine regional meetings were held, in which Public Roads personnel participated with State accounting officials. Public Roads personnel made financial management reviews in Alaska, Indiana, and Kentucky. A long-range financial management study in Iowa, in which Public Roads participated, was completed.

A statistical sampling plan for use by field auditors in auditing State claims for reimbursement, developed after last year's research in this technique, was successfully field-tested at two locations and was being tested further in several others.

Concurrent audit plan

A concurrent audit plan was developed during the fiscal year, whereby a State's operating procedures and reimbursable costs on Federal-aid highway projects are reviewed and audited by Public Roads auditors concurrently with the progress of the work. Vouchers submitted to Public Roads by the State covering reimbursement for work done may then be processed for payment promptly upon receipt. Benefits of this procedure, in addition to prompt payments to the State, include early reporting of audit exceptions, better financial and budgetary controls, greater effectiveness and efficiency of operations afforded by more comprehensive internal controls, and improved reporting to top management on results of operations. By the close of the fiscal year the concurrent audit program had been adopted by two States, partially implemented in a third, and was in the developmental stage in nine others. Thirteen additional States expected to adopt the program during fiscal year 1963.

In a separate but related program, Public Roads encouraged the States to undertake the audit of railroad and utility claims on Federal-aid highway projects. Under this plan the States assume responsibility for the audit of railroad and utility claims and their auditing costs are eligible for reimbursement in the same manner as other project costs. Five States were using this procedure at the close of the fiscal year and 21 additional States were expecting to adopt the plan soon.

Training

Public Roads' well-established training program for young engineers continued in operation. Two new planned manpower development programs were also underway. One of these, the "master's degree program," consists of a series of assignments over an 18-month period to develop engineers holding master's degrees for specialist positions necessary to the highway programs, such as planning, hydraulics, and bridge engineering. The other program, designed to develop administrative executives, is recruiting high-level college graduates into a 2-year specialized course in administrative management, with options in personnel, finance, and administrative services.

Workshops for division office administrative managers on their audit and fiscal responsibilities were conducted in 6 of the 10 Public Roads regions during the year. A seminar on financial management problems and objectives was held in Washington for regional assistant executive officers and senior auditors.

Some of the many other training programs conducted by or for Public Roads are mentioned in other sections of this report.

Project examination division

The project examination division was established in Public Roads in June 1957 to maintain vigilance over all aspects of the programs administered by the Bureau. During the fiscal year reviews and inquiries conducted by this division necessitated active field work in 24 States on one or more occasions, several of the operations extending over many months. These investigations found many commendable practices in Public Roads and State operations, and also pointed out means for effective elimination of certain areas of potential weakness.

In one State it was necessary to conduct a detailed review of a large number of projects. As a direct result, certain contractors and State employees were found unacceptable to Public Roads on Federal-aid projects for specified periods of time.

Numerous allegations of irregularities in the highway program were investigated during the year. When the results so warranted, these matters were referred to the Department of Justice. In other instances, the allegations were found to be unsupported. Increased coordination and cooperation with the Department of Justice brought about a corresponding increase in effectiveness. In one State this expanded activity was largely instrumental in the return of 18 indictments by a Federal grand jury.

Similarly, additional emphasis has been placed on cooperation with State highway departments and State prosecuting agencies. In one State this action resulted in the indictment of a supplier of highway material and three of its employees.

Impetus provided by the project examination division resulted in the preparation of guidelines for use by Public Roads field personnel in detailed inspections of construction and land acquisition. These inspections have been extremely effective in disclosing previously unrecognized deficiencies in various phases of the highway program and enabling the taking of necessary corrective action.

AASHO Road Test

Completion of the $27 million AASHO Road Test, sponsored by the American Association of State Highway Officials with Public Roads and other participation and administered by the Highway Research Board, was one of the significant research achievements of the fiscal year.

Final findings of this important cooperative research project were presented and discussed at a 3-day conference held in mid-May in St. Louis, Mo., and attended by 800 engineers and others interested in the outcome of the test. Public Roads personnel were actively involved in the formal presentation of results. By the date of the conference, six reports on the Road Test had been published by the Highway Research Board, covering all aspects of the conduct and findings of the project. It was anticipated that the final summary report would be available in the fall of 1962.

The most important product of the Road Test was the development of significant relationships between axle load and pavement performance for a wide range of loads and pavement thicknesses. The formulas developed show relationships between performance and design as well as loading, and will be invaluable to engineers for scientific pavement design and traffic regulation.

An important byproduct of the project was the development of a serviceability-performance concept—a method of defining the performance of pavements in terms of the amount of traffic they will carry before losing their ability to serve traffic adequately because of wear and failure.

Final reports of the AASHO Road Test emphasize that the findings are based on the conditions at the test site in Illinois. At year's end, extensive plans were underway to translate these results to other conditions of soil, climate, and traffic.

The AASHO Road Test results will have far-reaching effects on both the design provisions of new roads and the upgrading of existing highways, and on the regulation of highway use.

Conversion of the test road into the originally planned section of the Interstate System was underway. In the rehabilitation process, test sections were being incorporated for continued study of behavior under regular traffic use.

AASHO Pooled Research Program

During fiscal year 1962 the American Association of State Highway Officials, in cooperation with the Bureau of Public Roads and the Highway Research

Board, launched a National Cooperative Highway Research Program which will concentrate on highway problems of national scope, too extensive or costly to be studied thoroughly by any one State or region.

Planning for this continuing program had been underway for some time. Financing will be wholly with Federal funds, the States having agreed to pool one-twentieth of their so-called 1½-percent research and planning funds for the purpose (without matching). The 1½-percent funds are the proportion of the annual Federal-aid highway apportionments that the States may use for research and planning. About $1.6 million of pooled funds were available for the first year of the cooperative program, and $2.5 million will be available annually thereafter.

AASHO committees, on which Public Roads has membership, will each year select specific projects for undertaking within research areas agreed on by the States. The Highway Research Board will administer the program, contracting the selected projects to universities and other research agencies.

At the close of the year, projects were being selected in the following six agreed-upon research areas:

1. Development of techniques to improve the traffic capacity and safety of existing roads and streets, including investigation of electronics guidance systems for controlling individual vehicles in a stream of traffic.
2. Evaluation of freeway lighting to determine how strong illumination should be and where located.
3. Study of snow and ice removal methods and chemicals, to devise techniques for rapid clearing of highways.
4. Development of methods for improving aggregates used in pavement construction.
5. Investigation and refinement of methods used to determine benefits accruing to motorists, truckers, and the general economy from highway improvements.
6. Translation of the results of the AASHO Road Test, recently completed in Illinois, to local conditions in other States.

Traffic Operations Research

Automated highway research

Public Roads has followed developments in highway transportation automation for a number of years through contacts with private organizations in the equipment development field. Public Roads also has initiated a number of research projects in the areas of surveillance, communications, and electronic aids which contribute to basic understanding of the generalized concept of automated highway transportation.

During the fiscal year plans were developed for a broad automated highway research program and a budget for the first phase of this program was proposed. The first phase would be a comprehensive feasibility study which would include the objectives of an automated highway concept and a systems analysis.

Human factors research

Research was completed on a study of driver attitude toward alternate routes. This study, made in cooperation with the State of Maine and the Maine Turnpike Authority, involved U.S. 1 and the turnpike. More than 3,300 drivers were interviewed, using an attitude test aimed at measuring their views toward the two highways. Galvanic skin response (GSR) tests, measuring tension, were made on test drivers traveling both routes. The GSR data indicated that significantly more tension was generated on U.S. 1 than

on the turnpike. Preliminary analyses showed that turnpike users held positive attitudes toward this kind of driving but nonusers were negative toward freeway driving. The negative attitudes were stronger than the positive attitudes toward turnpikes, indicating that the subjective benefit of freeways may not be as great as direct economic benefits.

Another study using the GSR equipment was underway on a 10-mile section of rural freeway to determine the generation of driver tension at travel speeds ranging from 35 to 70 miles per hour. This research was aimed at explaining an anomaly found in a previous study, which indicated that high-type expressways generated more tension than expressways with less rigorous design. This research should lead to further insight into the processes underlying driver comfort and convenience.

An investigation using a newly developed electronic instrument for continuous tracking of the path of a vehicle was conducted to determine the perceptual and field factors affecting lateral displacement. Results indicated that transverse movement of a vehicle was directly influenced both by speed and by the proximity and shape of an object located laterally from the line of travel. In addition, the results offered verification of a proposed theory of rate of visual angle change as a basis for vehicle steering.

A new program of research was undertaken to study how an automobile driver achieves stable steering. A test track study, one of a series of controlled experiments on vehicle control behavior, was initiated to determine what perceptual information a driver uses as a basis for his continuous judgment concerning steering for single-lane driving on a straight road.

Other research was initiated in the laboratory to ascertain the extent of deterioration of guidance control that may be present when the driver divides his time between staying properly centered in his lane and searching out features of the environment such as road signs. For this purpose, a basic driver simulation facility was developed.

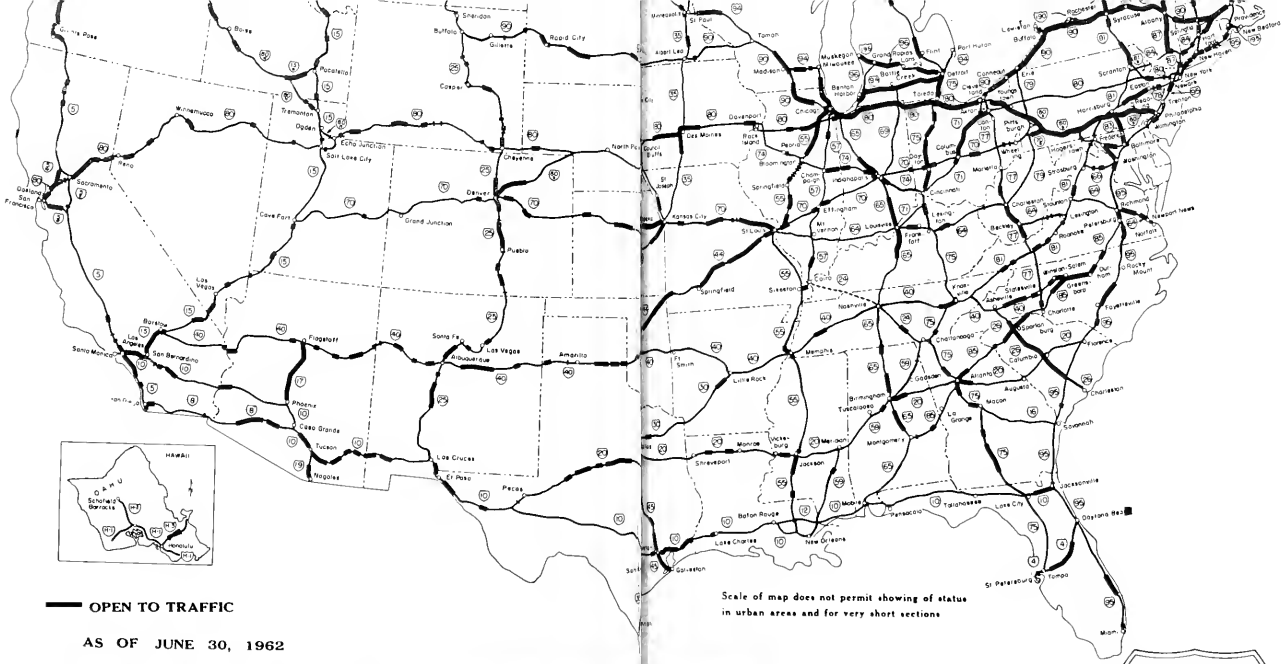
An investigation on vehicular headway being conducted for Public Roads by the Applied Psychology Corporation was aimed at isolating those driver characteristics and environmental factors that significantly influence following-distance behavior.

The Battelle Memorial Institute was continuing research for Public Roads into the problem of the kinds of information that should be transmitted between drivers. Through field research an attempt was being made to establish some criteria for communication and some variables by which the information load upon the driver could be measured. This work indicates that the information processing model is generally applicable as a criterion for inter-vehicle communications. However, the attempt to develop measures of this loading proved to involve dimensions that were not predicted from their original model. Drivers appear able to handle considerable amounts of information before they need to make compensatory responses in their driving.

A cooperative research project at the Cornell Aeronautical Laboratory was undertaken to develop techniques that may be used to determine objectively what form and requirements are necessary to simulate driving performance. These studies were aimed at determining what progressive steps may be employed in part task simulation of driving or may be employed in large scale simulation, where human adaptive behavior often masks the operational response modes of the driver.

Driver behavior research

Considerable technical assistance was given to expressway surveillance projects in Michigan and Illinois. In Detroit, the installation of lane-use and speed controls was completed and testing begun. A report on freeway shoulder usage



Open to Traffic	Under Construction	Engineering Day in	Remaining Mileage
12,550 Miles	4,801 Miles	10,9	12,722 Miles

28,278 Miles

INTERSTATE

TOTAL 41,000 MILES

was completed and a number of other reports were being prepared. For the Chicago project, purchase and installation of automatic surveillance equipment was approved after extensive evaluation tests with the Public Roads traffic analyzer. Validation of the pilot system will begin when installation is complete.

A study of the effect of small cars on the traffic stream was completed and reported by Michigan State University. A comparison study by Public Roads was also completed and reported. Both studies found that small cars had no significant effect on spacing and speed.

Also underway were studies of lane volumes and distributions on urban expressways, the relation between speed and headways of paired vehicles, and the relation of traffic volume to average speed and average difference in speed.

Technical assistance was provided to several State highway departments. In Minnesota a study of color coding for interchange ramps was begun. In Pennsylvania a study of a median guard-rail installation was started and another study involving yellow median guardrails was planned in New York. Research was undertaken in Maryland and Minnesota to determine if edge line striping increases a driver's awareness of approaching access points and of vehicles at those points.

Highway capacity research

The report, *Increasing the Traffic-Carrying Capability of Urban Arterial Streets* (often referred to as "The Wisconsin Avenue Study"), was published during the year, and a supplementary appendix report was being printed.

A study of spacing of freeway ramps by computer traffic simulation was initiated for Public Roads at the Midwest Research Institute. In the first phase, the goal is to determine whether known traffic flows observed on freeways under a variety of ramp spacing conditions can be simulated successfully on a computer. Field studies to be conducted to obtain the necessary validation data will provide greatly needed data regarding traffic behavior between ramp junctions.

The data-gathering phase of the nationwide freeway ramp capacity study was completed in the spring of 1962. A total of about 220 studies had been received and analyses were well underway. The data will provide means for a wide variety of investigations of specific questions regarding ramp operation.

An investigation was undertaken of the effect of buses in freeway traffic flows in several major cities. Conditions being studied ranged from only a small number of buses in the traffic stream to the all-bus operation under specialized conditions.

Motor-vehicle accident costs

A State-wide accident cost study being conducted cooperatively with the Illinois Division of Highways was nearing completion. Two principal applications of the accident data were contemplated: assessing the efficiencies, in terms of accident exposure, of the various types of highways and highway systems; and relating accident experience of Illinois registered passenger cars and trucks of different sizes and weights with their respective travel on the different highway systems of the State.

A similar study was undertaken in Ohio, featuring an investigation of the characteristics and costs of accidents occurring on the Interstate System and on all major highways according to the degree of access control. An additional feature is the determination of accident frequencies and costs for American "standard" passenger cars, American compacts, and foreign cars.

A third accident cost study, getting underway in the District of Columbia, will permit a concentrated evaluation of accident occurrence in a purely urban area. One objective is the determination of accident experience for the 9,000

taxicabs operating in the area. Another relates to traffic operation and accident frequency on major street systems during peak and off-peak hours, and the incidence of accidents with respect to one-way streets, parking conditions, and types of traffic control devices.

Interstate accident study

An initial report of the Interstate System accident study, which compares accident, injury, and fatality rates for completed sections of the Interstate System with nearby existing highways, was nearly completed. The report, containing data from 16 of the 43 States who were participating in the study, compares rates on 1,130 miles of Interstate highways open to traffic to those on 1,000 miles of nearby older type highways. The accident rates for the Interstate highways were considerably lower. A more detailed Interstate System accident study relating accident experience to geometric design was underway in 3 States with 18 other States expected to provide data during the coming year.

Motor-vehicle transportation studies

Research was continued to establish the differential road-user benefits that result from improvement of rural and urban highway systems. Field tests were continued to determine the effects of number of traffic lanes and traffic volume on the fuel and time consumption of passenger cars.

The completed study of line-haul trucking costs in relation to vehicle gross weights was being followed up by putting highway and truck operating costs together to obtain optimum overall transportation costs. Another related study nearing completion concerned dimensions and weights, by type of cargo body, of trucks and trailer combinations weighed at loadmeter stations in 46 States.

In a cooperative research study, the University of Washington investigated the fuel consumption, speed, and acceleration characteristics of large gasoline- and diesel-powered commercial vehicles operating over a variety of highway profile conditions. From the data collected, factors were developed for predicting vehicle performance and fuel consumption. These may be used by the highway engineer to select highway alinement on which vehicles will operate most economically or to predict potential user benefits that may be derived from an improved highway facility; and by the vehicle operator to select the vehicle best adapted to the terrain it must traverse.

Instrumentation development

The first traffic impedance analyzer built by Public Roads has been in constant demand. A new analyzer built during the year measures the same traffic parameters as the first one—speed, distance, time, and fuel consumption, plus manual condition code insertion—but has an increased digital capacity and uses a high speed teletype tape punch for recording so that automatic data processing without tabular transcription is possible.

In its instrumentation development, Public Roads was using solid state circuitry. Along with the time and cost saving advantages of etched and printed circuit techniques, the field instruments developed may be powered by automobile batteries, will be very compact, will require almost no field maintenance, and may be packaged for vehicle use without need for ventilation.

Economic Research

Highway cost and investment research

A pilot study of the effects that various traffic volumes have on the length of service lives of asphalt and concrete pavements in California was nearing com-

pletion. A study of the effects of the stepped-up highway program on the service lives of highways was continuing.

Intensive study was undertaken to develop procedures to determine the cost to construct highway facilities of different levels of structural capacities for various sizes and gross weights of commercial motor vehicles.

Highway finance and taxation research

Research in connection with the allocation of the financial resources of governmental units and the present position of highways in the allocation of such resources was initiated during the year. A further study of third-structure taxes, such as the ton-mile tax, also was underway.

A report on studies made in several States of the motor-fuel consumption characteristics of privately owned passenger cars was completed.

In cooperation with the University of Missouri, an investigation was underway of the various highway cost allocation theories—the basic concepts and their applicability to the allocation of highway costs between user and nonuser and among various classes of users.

Engineering economy research

A basic study of the methods and applications of the principles of engineering economy to highway improvements was completed. Two reports were published and others were being prepared.

A draft paper on the subject of the value and cost of travel time to the occupants of passenger cars was prepared in connection with a study of the value of travel time to this class of highway users. Research of this area continued.

Research was continued on the factors that make up the benefit-cost ratio which is applied in evaluating the economy of highway improvements.

Economic consequences of highway improvements

Important progress was made during the year in the research program dealing with the economic consequences of highway improvements. The studies emanating from this program, as well as those in progress, encompass a wide range of factors related to highway improvements, including effects on interchanges, commercial, industrial, and residential areas, land use and values, and central business districts.

The 29 economic impact studies completed during the fiscal year brought the total number of such studies completed to 119 in 30 States. Included were 17 studies of nationwide scope. At the end of the year, 47 economic impact studies were in progress in 33 States.

A Texas study, which evaluated the economic effects of the accessibility of an expressway on adjacent land use and values as well as on a community located 15 miles from a large metropolitan area, was representative of other studies of the same type. The study found that population in the affected community increased from 3,000 to almost 17,000 during the 5 years following completion of the expressway. At the same time, prices for abutting land rose by 269 percent. Prices of nonabutting land rose only 17 percent.

Emphasis continued to be directed toward studies evaluating the economic consequences of interchanges on areas served by such facilities. A notable contribution to this field was a five-part study, plus an introductory progress report, by a team of researchers at the University of Washington. This study considered the problem of congestion and economic development at interchanges.

Another study, by the Texas Transportation Institute, evalnated land-use changes in the vicinity of 10 interchanges in Texas. Similarly, the U.S. Department of Agriculture prepared a study of the economic and legal aspects of interchanges which dealt mainly with rural areas.

Studies investigating the impact of interchanges on communities and local areas were undertaken in a number of States. Some of these attempted to define the interchange community in terms of economic arrangements, while others dealt with the economics of land development.

Studies of the consequences of bypasses on the economics of nearby communities were continued. During the fiscal year several such studies were completed, including one in Utah which covered the sociological factors in the affected community such as recreational and organizational activities, community patterns, attitudes and their relation to the highway improvement, and the travel patterns of persons in the community. Bypass studies underway included a wide range of analyses, from an evaluation of the economic consequences of the Capital Beltway circling the Washington, D.C., area to studies in smaller urban areas.

During the year the Michigan State University Highway Traffic Safety Center, in cooperation with Public Roads, completed five segments of a comprehensive study on the economic and social effects of highway improvements. One part of this study evaluated the impact upon land use, as well as the changes in the number of structures built, resulting from the use of Michigan highways. Through an analysis of the mapping procedures utilized in the study, it was found that highways were the major means by which the processes of dispersal of urban populations and forms of settlement have exerted their impact upon the land uses of the study area.

An evaluation was made of major population trends in the United States, with emphasis on highway implications. Summary analyses were prepared of population and employment for areas of over 1 million population, and estimates were made of areas that may reach 1 million population between 1960 and 2000. Population and employment trends for all areas over 500,000 population were being correlated with information on primary means of transportation used in going to work as well as automobile availability.

Studies were made of the factors determining automobile density in selected urban and rural areas in Virginia, and by selected census tract for Richmond and Norfolk, Va., and for the District of Columbia.

Highway and Land Administration Research

Right-of-way research

In cooperation with the American Association of State Highway Officials, a revised outline for a manual for training right-of-way personnel was completed and commitments were obtained for authorship of the various sections to be included. A questionnaire on right-of-way training needs was drafted for submittal to all persons engaged in right-of-way work throughout the Nation. Assistance was given to several of the State highway right-of-way departments in organizing and conducting training programs for their right-of-way personnel.

The final draft of a study of liaison between utilities and highway departments, undertaken in cooperation with AASHO, was partially completed.

A review and analysis of all condemnation decisions handed down by the courts, in which right-of-way problems were at issue, was completed and a report made in cooperation with the American Bar Association.

At the request of the Department of the Interior, in connection with its study of land policies, a report was prepared describing activities of Public Roads and the State highway departments that contribute to current open space objectives, and suggesting additional ways and means whereby some of these present activities could be expanded to further advance open space reservations.

Special studies of existing right-of-way organization and practices were

completed in three States and recommendations were made as to ways to bring about improvements.

A report was being prepared of a study of highway classification, analyzing laws pertaining to highway system classification for secondary State highways, county and township highways, and municipal street systems, and making recommendations as to more functional classifications.

Assistance through research and data collection and analysis was given a number of States in connection with a wide variety of right-of-way problems.

Severance damage research

Several additional land economic studies (severance damage and proximity studies), which promise to be helpful in the land acquisition process, were initiated with the cooperation of the States. A manual recommending procedures for conducting severance damage studies was issued along with a standard data collection form. Severance damage research was underway in 40 States. A number of States were submitting case study information for inclusion in Public Roads' national "bank" of cases, using either the case study form or punch cards, and in addition were setting up their own individual State banks of such data. More than 300 case studies from 11 States had been placed in the Public Roads bank and cases were being added steadily. Analysis of these cases provided interesting and significant findings: for example, concerning the relationship between property values before the highway taking and amounts actually received through subsequent sales by the affected owners. Comparisons of this type and others were planned.

Administrative research

A report on training programs in State highway departments was virtually completed. A report on a census of highway engineering employees in counties and cities was in progress. Revisions were made in tabulations of directing organizations of State highway departments and of salary ranges of principal officials of State highway departments. Work was begun on a study of civil service systems in State highway departments. A broad-gaged administrative study was undertaken in one State, at its request.

Highway laws research

Public Roads continued its program of cooperation with the States in highway laws improvement, working with individual States on code revision projects. In cooperation with the Highway Research Board, Public Roads prepared reports on various phases of Federal, State, and local highway law of national significance. Most of the latter work was on maintenance, finance, and system classification law studies, and first drafts of reports on each were substantially complete.

Public Roads staff studies on the relationship between land-use controls and highways were continued, and several field studies to develop practical standards for application of the general concepts were underway. These studies were concentrating on areas around interchanges, where the land-use and traffic conflict is apt to be most acute.

Staff assistance was provided to the Highway Research Board committee on urban transportation research.

An analysis of the use of economic study data to prove damages to land, and the admissability of such data in court, was made.

Hydraulic Research

A MAJORITY of State highway departments were sponsoring long-term investigations of rates of water runoff from small watersheds. Public Roads

participated in the financing and planning of seven of these studies. In all cases the actual work was being done by the U.S. Geological Survey. Flood frequency reports were available for about 25 States.

Stormwater runoff from selected urban areas in Baltimore, Md., and vicinity was being measured and analyzed under a continuing project conducted by The Johns Hopkins University and sponsored by Public Roads, the Maryland State Roads Commission, Baltimore City, and Baltimore County. An analysis by Public Roads of the rates of flow was completed for publication.

Basic research on the movement of flood waves through a storm drain was being conducted by Colorado State University, financed by Public Roads and the Public Health Service. A full-scale model under construction will be used to verify water surface profiles developed theoretically and computed electronically.

Experiments on capacity of curb-opening storm drain inlets have been completed at Colorado State University for Public Roads.

The final report of a Public Roads–Corps of Engineers study of the flow capacity of corrugated structural plate metal pipe (2-inch corrugations) was being prepared by the Waterways Experiment Station at Vicksburg.

The National Bureau of Standards was investigating means of improving flow through box culverts for Public Roads. A final report on improved pipe culverts was completed. Industry was applying the results to development of commercial products which will effect greater economy in culvert installations.

Purdue University continued laboratory research on flow through arch bridges under a cooperative project of the Indiana State Highway Commission and Public Roads.

Physical Research

PUBLIC ROADS' WORK in the many and varied fields of physical research is accomplished by its own staff and laboratories, by contract, and as cooperative projects with State highway departments and through them with universities. The cooperative projects are financed with the 1½-percent of Federal-aid apportionments to the States available for research and planning, and Public Roads participates in the selection and planning of the research, reviews the progress of the work, and often participates in the reporting of results.

Soils and foundations

Considerable effort was expended during the year in developing and evaluating apparatus for measuring the physical condition and characteristics of soil materials.

Progress was made by Public Roads and Arizona, Arkansas, Colorado, Indiana, Kentucky, Maine, North Carolina, Ohio, and Oklahoma in the development and evaluation of nuclear apparatus for measuring the moisture content and density of soil materials and aggregates, important in construction control. Public Roads developed a series of calibration curves for a variety of materials for use with one nuclear apparatus.

Vanderbilt University began a study to develop sonic apparatus for rapid measurement of moisture content and density of soils and aggregates and to measure the density of flexible pavement layers.

Public Roads' evaluation of a commercially manufactured electrical resistivity device resulted in improvement of the electrical system so as to identify more accurately materials in geophysical explorations. Further work was done to determine the feasibility of using electrical resistivity apparatus in measuring small natural electrical potentials that indicate specific ground conditions. The resistivity apparatus also was used by Public Roads on proposed highway lo-

cations to identify landslide conditions and to locate solution cavities in limestone. Evaluation was continued of light-weight seismic apparatus for use in shallow subsurface investigations.

The occasional necessity for building highways across swamps, particularly in urban areas, has led to new methods of evaluating such soft foundation materials. Public Roads continued its laboratory evaluation of vane shear apparatus for testing core samples. Illinois, Oregon, and Washington were studying this and various other methods of evaluating such foundation conditions. Public Roads has nearly completed a motion picture on sand-drain stabilization of soft foundation soils on a Virginia project. Nebraska continued a study of settlement of high embankments over soft foundations.

Georgia Institute of Technology continued a model study to develop a pile foundation design method based on strength of soil strata penetrated by the pile. North Dakota continued a correlation of bearing capacity of test piles and predicted values of pile-driving formulas. California began a study of seismic effects on piles in deep clay deposits.

Public Roads completed a study of reaction products of the clay mineral montmorillonite and organic cations. Arizona completed a study on soil plasticity and dielectric constant and began work on another investigation concerning stabilization of montmorillonitic clay soils by prevention of expansion through the use of chemicals.

In a cooperative program with the chemical industry for developing soil stabilizers, Public Roads tested a potential stabilizing chemical with a number of experimental soils. Minnesota, the Georgia Institute of Technology, and North Carolina continued laboratory and field studies of the relative merits of mixtures of lime, bitumen, and chlorides with soil-aggregates in pavement structures, the use of soil stabilizers in bituminous-soil mixtures, and the effectiveness of chlorides, portland cement, lime, and lime-fly ash as additives to subgrades and base courses in minimizing the effects of frost action. West Virginia University completed a study on use of the factorial design statistical method to evaluate the effectiveness of fly ashes in highway construction. The University of Illinois completed a literature survey of the use of phosphoric acid as a soil stabilizer, conducted limited laboratory studies of soil-acid mixtures, and also prepared a paper on the particle index test in its continuing study of soil-aggregate mixtures.

Considerable progress was made throughout the United States in developing soil and materials maps and reports that are useful in highway location and design. Thirty-four State highway departments assisted Public Roads in testing soil samples and preparing engineering interpretations for county soil survey reports sponsored by the U.S. Department of Agriculture. The final manuscripts for the engineering section of 27 county soil survey reports were approved for publication. The development of engineering soil maps and reports for highway engineering purposes only was continued in eight States.

Public Roads used color aerial photography in studies of ground conditions and potential material sources in the Rocky Mountain area.

Public Roads reported a study in which compaction and classification test data were correlated by computer analysis for 527 soil samples obtained from various areas of the United States.

Bituminous materials and pavements

Research on the fundamental properties of bituminous materials was continued. Two reports were published on the development of methods for measuring absolute viscosity and the application of these methods to specifications. They showed the advantage of fundamental viscosity over conventional methods for measuring consistency of liquid asphalts but pointed out the need for

further study for their application to asphalt cements. Another report showed that absolute viscosity measurements could be used to evaluate the hardening characteristics of asphalts without materially changing the acceptance or rejection of the materials as now determined by conventional methods. A study was completed on the relation of absolute viscosity of the asphalt binder to laboratory stability of paving mixtures.

Public Roads and the asphalt industry jointly sponsored five regional conferences for highway agencies and other consumers and producers of asphalt. New simplified specifications were introduced for liquid asphalts, incorporating the use of fundamental viscosity for controlling consistency. General acceptance of the new specifications should result in more economical asphalt materials of the liquid types, and improved test methods.

Studies were continued on liquid asphalts to develop additional improved control test methods; on new materials proposed as binders for road surfaces; and on relatively new binders for constructing colored pavements. A report on a laboratory study of coal-modified tar binder was completed. New York reported on a cooperative study of cationic emulsions.

Cooperative studies with technical committees of the American Society for Testing and Materials aimed toward the development of new standard test methods and specifications were completed and reported.

A new graphical chart was developed to facilitate the evaluation of the sieve analyses of aggregates for bituminous paving mixtures and other uses. In this chart gradations for theoretical maximum density plot out as straight lines, providing a reference for comparison with actual gradations.

Aggregates and their suitability for bituminous mixtures were the subject of several investigations, including studies of certain unproven materials such as an expanded clay and micaceous sands. A report on the application of infrared spectroscopy for the evaluation of mineral fillers was published. A laboratory and field study was conducted with the District of Columbia on asbestos fiber as a mineral filler for a bituminous overlay mixture.

A portable static compactor for molding bituminous mixtures at the paving site was constructed, and correlation of this device with the standard laboratory procedure was undertaken. The Corps of Engineers' mechanical gyratory compactor was used in a number of mixture investigations and an interlaboratory test program was initiated for the purpose of standardizing techniques. Louisiana and West Virginia began studies with this device to correlate molding variables with field compaction and to develop a mixture design procedure.

Nuclear techniques for measuring the density of bituminous pavements and the determination of asphalt content were the subject of research in Arizona, Colorado, Ohio, Oklahoma, and Virginia.

Flexibility and fatigue characteristics and the rheological properties of bituminous mixtures received continued attention in research conducted in Illinois, Ohio, Oregon, Texas, and Virginia.

Work was continued on a study to determine the effect of drying plant operations on the surface characteristics of aggregate particles as reflected by resistance to the film-stripping action of water. A project completed in North Carolina on the effect of plant mixing temperatures on hardening of asphalt showed that excessive temperatures were detrimental. A New York study sought to determine the uniformity of hot-bin aggregates and plant mixtures; a Wisconsin study was concerned with the extent to which deviations from job-mix formulas may be tolerated. Florida, North Carolina, Ohio, and West Virginia were investigating the optimum temperature and viscosity for plant mixing and compacting asphaltic concrete. Compaction with high-pressure pneumatic rollers was studied in Louisiana and found to be very satisfactory.

To develop correlation of physical properties of bituminous mixtures with field performance, Public Roads continued to work with Delaware, Maryland, and Virginia in the evaluation of test roads. A final report on the Maryland project and a progress report on the Delaware project were prepared. These studies have provided confirming evidence that the high rate of aging of asphalt in service is largely associated with high air void content of the pavement. Investigations of several pavements with excessive cracking has provided additional evidence of this relationship. Arkansas, Louisiana, Maine, Nebraska, Oregon, South Carolina, and Texas were also attempting to correlate field performance with mixture properties. The information being developed should provide improved performance as a result of better specifications for materials and construction.

Studies to improve the structural design methods for flexible pavements were continued. The Oklahoma study of selected flexible pavement sections to re-evaluate current design methods and procedures was concluded, and similar studies were continued in South Dakota and Arkansas. Studies were begun or continued in Florida, North Carolina, North Dakota and South Carolina to translate the results of the AASHO Road Test to local environmental and soil conditions. Studies of selected pavements to correlate wheel-load and pavement deflection with pavement design and performance were underway in five States. Georgia Institute of Technology continued a laboratory study to provide fundamental data on the mechanics of load support provided by several base course types, and an interim report was prepared.

West Virginia University was evaluating sandstones for base courses in the laboratory by application of a rolling loaded tire to full-scale model pavements. Oregon began a study of the effect of gradation of aggregates on the shear strength and permeability of base courses.

For a symposium on structural design of flexible pavements, Public Roads prepared a paper on the effect of shear loads on pavements and one on a final analysis of data obtained in the Hybla Valley, Va., loading tests on full-size, specially constructed pavement sections.

Cement, aggregates, and concrete pavement

A report prepared on the resistance of concrete surfaces to scaling caused by de-icing agents showed the important role of entrained air in the prevention of scaling. Silicone and latex admixtures were effective in minimizing scaling, but most protective surface coatings were of little benefit. Studies of the effect of linseed oil surface treatments and silicone admixtures on scaling were continued.

The results of splitting tensile tests on approximately 2,000 cylinders made with concrete containing both natural and lightweight aggregates, and comparisons of these tests with flexural and compressive strength tests, were reported.

Research in the field of lightweight aggregate concrete was accelerated during the year to keep pace with the increasing use of this material. Variations in the strength, durability, density, and volume change of concrete prepared with lightweight aggregates from 20 different sources were determined. A specification for lightweight aggregates of suitable quality for bridge deck construction was developed for use in Federal-aid work. A study of the creep characteristics of lightweight aggregate concrete under sustained loading was begun.

An investigation of the current ASTM method of testing liquid membrane-forming curing agents for water retention was started. A summary was being prepared, as a reference for State highway departments, of the properties of membrane-curing agents, including the results of spectral and chemical analyses as well as those of physical tests. A study to determine the value of foam covers and semisolid seals for curing concrete was initiated.

Work on the development or improvement of test methods for concrete and related materials, for construction control, was continued. Under study were rapid methods for determining the shrinkage of cement paste and mortars, the cement content of fresh concrete, and volume changes in lightweight aggregate concrete, and a simple test to measure the abrasion of aggregates. Tests to appraise the physical properties of epoxy resins and similar quick-bonding agents were also under development.

An investigation dealing with the durability of concrete bridge decks was conducted cooperatively with the Portland Cement Association and 15 States. Also included in cooperative research programs were studies of the beneficiation of aggregates, improvements of methods for testing aggregates, the performance of bridge decks built with lightweight aggregate concrete, the effect of size of coarse aggregate on the strength of the concrete, the effect of chert in aggregates on the durability of concrete, and methods for curing prestressed concrete.

An ultrasonic pulse technique apparatus for nondestructive measurement of the thickness of concrete pavements was constructed and was being evaluated by Public Roads.

Cooperative investigations of continuously reinforced portland cement concrete pavements were continued in seven States. Progress reports on the Maryland experimental pavement were published. Thirteen States have built such so-called jointless pavements, equivalent to 200 two-lane miles. Lap requirements for the longitudinal reinforcing steel and end anchorages as a possible solution to the problems associated with large end movements were current areas of research.

Statewide performance surveys of concrete pavements in Illinois, Maryland, Michigan, and Oklahoma were continued, and a report on the Michigan study

Electronic apparatus being developed by Public Roads to measure the thickness of concrete pavement nondestructively is demonstrated to a group of visitors.

was prepared. Increasing interest in the "pavement serviceability-performance concept" developed at the AASHO Road Test was noted, and cooperative studies using this concept were started in Illinois, Michigan, North Carolina, and Virgina.

Cooperative concrete pavement research underway included moving load tests on an experimental prestressed pavement; methods of forming contraction joints, including sawing and the new types of metal and plastic inserts; prevention of corrosion of dowels with stainless steel sleeves and nickel coatings; and subbases for the prevention of pumping. Also included were studies of the cause and prevention of erratic cracking in concrete pavements; application of a photographic technique of recording the surface condition of pavements; and the effects of dynamic loading of concrete pavements.

Chemical investigations

Outdoor exposure studies of rust-inhibitive paints for steel were continued and the results to date show that new paints such as basic lead silico-chromate and zinc-rich inorganic paints afford equal or better corrosion resistance than the older standard paint systems.

A report of a survey of the performance and economy of thermoplastic traffic striping materials for highways was completed. The survey indicated that the high initial cost of this material made it somewhat less economical than regular traffic paint in long-term use on open highways. In Washington, a field research study was completed on semi-permanent traffic marking materials. Preformed traffic buttons gave the best overall visibility under rainy conditions.

A study in Georgia on the application of radioisotopes for evaluating the performance of traffic paints was continued. A cooperative investigation was continued to determine, by spectroscopic tests, the uniformity of shipments of traffic paints. Preliminary results indicate the value of both infrared and ultraviolet spectroscopy as rapid means for detecting traffic paint adulteration

A revision of the Federal specification for traffic paints was completed and published. The revision included three acceptable compositions for traffic paints of improved performance.

A report on the potential application of spectroscopic methods in highway laboratories as a rapid means of testing and determining the uniformity of materials was prepared.

Road surface research

Cooperative research on the riding quality of pavements was continued in five States. Chloe profilometers developed at the AASHO Road Test were used in a nationwide survey conducted by Public Roads on pavements scheduled for resurfacing. The average "present serviceability index" for rigid and flexible pavements was found to be 2.2 and 2.1, respectively. Two of these devices have been acquired by Public Roads for loan to State highway departments.

A promising new two-wheeled skid-resistance trailer was completed and will participate in the skid correlation study to be held in Virginia in August 1962. The British portable skid-resistance tester was used in cooperative studies with ASTM Committee E–17 on Skid Resistance to determine the relative merits of natural and synthetic rubber sliding pads.

Highway guardrail and bridge railing research

Full-scale dynamic tests on highway barriers by New York in cooperation with the Cornell Aeronautical Laboratory were expanded to include limited tests of bridge railing. Impact tests have been made with automobiles on 4-cable and standard steel-beam guardrails and on a rigid-beam rail supported on flexible posts. The rigid-beam rail performed adequately, permitting little penetration and preventing vehicle pocketing, wheel snagging, rollover, and pitchover. Math-

ematical equations representing the structural response of guardrails were being developed.

A preliminary analytical study, based partly on the barrier tests, was made to explore optimum characteristics for a bridge rail. Full-scale dynamic tests will be made on the standard welded steel bridge rail used in New York and on a welded steel rail based upon a revised specification for bridge railing prepared by Public Roads for consideration by the AASHO Committee on Bridges and Structures.

Bridge research

Dynamic test studies of bridges, conducted by Public Roads, help to verify or correct the assumptions used in the design of bridges. A report was published during the year on such studies in Nebraska; reports on studies in Missouri and South Dakota were being prepared. Similar studies were made in Virginia and Texas and the data were being analyzed by the States. Plans were underway to cooperate with New York and Texas in dynamic test studies of concrete bridges to be built in the fall of 1962 in which high-strength reinforcing steel will be employed at appropriate high design stresses. These studies will seek to determine the effect of the high stress upon the formation of cracks in the concrete and the dynamic behavior of the bridge.

Studies made in the Public Roads wind tunnel on one-fiftieth scale section models of the proposed suspension bridge over the Tagus River at Lisbon, Portugal, showed that the structure will have satisfactory aerodynamic stability. Wind tunnel studies of an electronic wind-measuring device being developed at the University of Washington showed the need for improvements, which were being undertaken.

Laboratory studies were underway to determine the nature, magnitude, and significance of changes in the properties of steel brought about by the cold forming of flat plates into welded tapered tubes for use as columns, light standards, sign supports, etc., and the effects of fabrication processes on the strength of the tubes.

Current revisions in the specifications and commentary of the Research Council on Riveted and Bolted Structural Joints, used as a guide by most specification writing bodies in this field, were based largely on the results of Public Roads cooperative research at Lehigh University and the University of Illinois. Two reports were published on the plate girder studies at Lehigh University and the project was continued. Two reports were being prepared on the cooperative tests on the half-scale model of a 200-foot steel truss bridge at Northwestern University. These reports will give basic information and will detail the load-carrying capacity of damaged end posts. A full schedule of tests is in progress. Cooperative studies at the University of Illinois on fatigue in various grades of steel, welding research, and inspection practice are pursuing urgent problems. This is true also of research on prestressed concrete at several universities.

Research on epoxy resins for structural connections, such as shear development in composite construction, advanced at Rensselaer Polytechnic Institute and the University of Arizona. They have led to a screening of suitable formulations and the determination of their fundamental engineering properties, which is prerequisite to their use for specific purposes. The early tests show promise for use in shear development.

Initial results of the tests at North Carolina State College on the action of diaphragms between steel bridge beams were being analyzed and further studies were in progress. Similar studies with respect to prestressed concrete bridges were beginning at Lehigh University. A report on full-scale and model tests on an 80-foot concrete box girder bridge in California was being prepared.

Research was begun in cooperation with a number of States to investigate the effectiveness of urethane foam or other insulating material placed on the under side of a bridge slab to reduce the tendency of icing on the bridge decks when the approach pavement, resting on the soil, is free of ice. Two studies of the efficiency and cost of electric heating of bridge decks in critical situations were also in progress.

Analysis was underway in a comprehensive study of diesel pile drivers in comparison with conventional steam hammers in cooperation with the Michigan State Highway Department and Wayne University.

Development Activities

Electronic computers

Efforts were continued during the year to extend further the effective use of electronic computers in the highway program. Forty-eight State highway departments were using computers in their engineering and administrative operations, and the range of applications was being expanded on a continuing basis. As part of this effort, Public Roads collaborated with the American Association of State Highway Officials in conducting regional conferences on improved highway engineering productivity at Boston in August 1961 and at San Francisco in March 1962. These conferences, devoted largely to applications of computers and other electronic devices, included sessions on new and improved methods, procedures, and equipment, with substantial participation by Public Roads.

At the request of the New York State Department of Public Works, Public Roads engineers made a thorough on-site study of electronic computer use in that department, covering current and planned applications as well as others of potential value. Public Roads also furnished technical advice and assistance on electronic computer use to the highway departments of the District of Columbia, Indiana, and West Virginia. Similar assistance was given to visiting highway officials from a number of foreign countries. An intensive training course in computer use in highway location and design was conducted for Public Roads headquarters engineers.

Two additional computer programs were developed in universally usable form for the Public Roads electronic computer program library—one for the hydraulic analysis of culvert flow, and one for the critical path method of project planning, scheduling, and control—making a total of 32 such programs available.

Equipment development and use

Public Roads continued to encourage the development and use of new and improved equipment in highway construction, maintenance, and operations.

The development of more practical grade reference systems for construction was promoted among equipment and electronic device manufacturers in order to make better use of the highly sensitive electronic grade-following devices which have been developed for graders, bituminous finishers, and concrete slipform pavers for improving the smoothness of base and surface courses. The commonly used string and wire references are subject to sag and must be installed close to the pavement edge where they interfere with the operation of other construction equipment.

Efforts were being made through membership in the joint subcommittees of the American Association of State Highway Officials and the American Road Builders Association on highway construction and maintenance equipment, to develop realistic application and performance guides and equipment specification requirements that will expedite the use of new developments of proven merit in the highway work-flow process.

Continuing progress was made with the State highway departments during the year in eliminating restrictive and inapplicable requirements in construction specifications. An additional number of States reduced their mixing time requirement for multicompartment pavers used in the production of portland cement concrete pavements. A substantial saving was achieved in production costs without sacrificing quality. Promotional efforts also were being directed toward reducing disproportionately high mixing times for producing bituminous concrete.

During the year two reports of national scope relating to materials and equipment were prepared by Public Roads. The first, dealing with highway requirements, was presented to the staff of the Business and Defense Services Administration in September 1961. A much more comprehensive study, *The Use of Materials for the Nation's Highways*, was prepared at the request of the Committee on Public Works of the United States Senate, as described elsewhere in this report.

Nuclear energy applications

During the fiscal year Public Roads continued to promote and encourage the use of nuclear energy applications in several areas of highway activity. Moisture and density determinations of compacted embankments and base courses by the nuclear method advanced substantially. Of the some 40 States using or evaluating the use of nuclear methods for compaction control, Pennsylvania, in cooperation with Public Roads, was the first to make a statewide evaluation of the new method for formulating a standard testing procedure. With commercial availability of three nuclear moisture-density gages, an improved climate existed for promoting the advanced method.

Public Roads, in cooperation with two State highway departments, advanced the development of nuclear-energized, self-luminous highway signs. The economic advantage of a self-energized sign has intensified research and development efforts in this area.

Public Roads promoted the development of a nuclear gage to measure the thickness of bituminous pavement elements at the time of placement and during its in-service life. Modification of a nuclear device was also placed under development as an instrument for use in controlling the thickness of bituminous pavement elements at time of placement. Use of radioisotopes in the development of a traffic paint thickness gage, wear test measurement, and spray applicator was started during the year. Consideration of the possible use of nuclear energy to improve soils for engineering purposes and as a source of heat in snow and ice melting was sponsored by Public Roads. The Atomic Energy Commission was cooperating with Public Roads in studying the implementation of nuclear energy for highway purposes, particularly where basic research was indicated as essential in the development of a beneficial application.

Public Roads continued in the advancement of new techniques, using the principles of acoustics for nondestructive testing of structures and analyzing of materials. Development of the sonic method to determine soil properties was encouraged, as was the utilization of ultrasonic measurements of pavement thickness and soundness. Extensive and general use of acoustics in industry awaits a breakthrough of an economic energy source. Public Roads continued to keep abreast of these developments.

Public Roads encouraged the use of infrared and ultraviolet spectroscopy in analyzing paint components to ensure quality control for highway purposes. Twelve State highway departments were using spectrophotometry methods for analysis and quality control of various highway materials.

Highway construction and maintenance production studies

A report covering findings, conclusions, and recommendations of the cooperative study of Iowa highway maintenance operations was completed and was published by the Highway Research Board. The manner of presentation was intended to stimulate all States in achieving better efficiency and improved methods of manpower and equipment use for the steadily growing highway maintenance workload. This report, the first of its kind, served as a guide for State-conducted highway maintenance management seminars during the year.

Studies were continued on improved drying of aggregates for bituminous highway pavements through a cooperative research study at Ohio State University. This work was supplemented with data from field observations of production model dryers. A cooperative research study was started at Stanford University to develop computer simulation of construction equipment operations. This effort is directed toward validation of a statistical-computer approach to properly balanced selection and use of equipment on highway construction operations.

Field production studies were completed on 28 projects, including several involving urban expressway construction, from which data were obtained on effective use of equipment time, performance, and productivity on construction jobs. Thirty junior engineers participated in these studies as assignments in the Public Roads training program. Eight of the projects involved extensive study of the thermal efficiency of aggregate drying operations for bituminous highway pavements. Work progressed in the preparation of additional reports in the series of *Road Research Releases*, issued by the Highway Research Board, using data developed from these equipment field studies.

Procedures and operations

In its continuing mission of contributing toward the reduction of construction costs while at the same time assuring high quality work, Public Roads made studies of construction specifications with the view toward effecting economy through simplification, standardization, and uniform application of the study findings.

An analysis made of coarse aggregate sizes specified by the 50 State highway departments, the District of Columbia, and Puerto Rico for portland cement concrete for pavements and structures revealed wide variations from established standards. Some 215 dissimilar coarse aggregate sizes were used for those items alone. Only seven aggregate sizes are recommended for use in concrete pavements and structures in the AASHO approved standards. Wide variations also existed in the sizes of coarse aggregates specified for bituminous surfaces. These findings led to comprehensive studies of aggregate problems by a committee of Public Roads technical experts. A consequent report, *Aggregate Gradation for Highways*, was published in May 1962. The report stressed the need for simplification, standardization, and uniform application of highway aggregate specifications. The report also included a new graphic evaluation chart which facilitates the selection of aggregate sizes for bituminous mixes.

Other studies were made on the use of base-course stabilization materials, guardrail, and aluminum culvert pipe.

Experimental projects

In cooperation with State highway departments and private industries, Public Roads continued to sponsor an experimental program using new, nonstandard, or alternate designs, new materials, and new methods in highway

construction. During the fiscal year 245 experimental projects were active, involving 45 different features. Analysis summaries were prepared on the use of lime in bituminous mixes and for stabilizing subbases and subgrades, preservative coatings for portland cement concrete pavements, and skewed contraction joints in concrete pavements. Analyses were underway on the disintegration of concrete bridge decks from the action of de-icing salts, and failures of some concrete pipe installations under various heights of fills. Work was underway on a revision of summaries on continously reinforced concrete pavements and on soil-cement bases, subbases, and subgrades. Several new experimental projects were initiated, employing new designs and construction techniques which promise to make further advances in the field of construction. The experimental use of such material as asbestos fibers, urethane, sulfur, epoxies, and elastic joint-sealing compound was encouraged and useful results may materialize.

Foreign Activities

Inter-American Highway

Since 1930 the United States, through the Bureau of Public Roads, has been assisting the Republics of Guatemala, El Salvador, Honduras, Nicaragua, Costa Rica, and Panama in the construction of the Inter-American Highway, which is that section of the Pan American Highway System from Nuevo Laredo, on our Mexican border, to Panama City at the Pacific terminal of the Panama Canal, a distance of 3,142 miles. The section of the highway in Mexico has been financed and constructed entirely by Mexico. Connecting highways from El Paso, Tex., and Nogales, Ariz., afford more direct routes to Mexico City from the western United States.

At the end of the fiscal year 96 percent of the Inter-American Highway was passable in all kinds of weather by motor vehicles. Of the total length of 3,142 miles, 2,627 miles were paved, 382 miles had a gravel all-weather surface, and only 133 miles in southern Costa Rica, where 39 bridges were under construction, were impassable. Upon completion of these bridges in late 1962 the entire highway will be passable at all times. The condition of the Inter-American Highway in the Central American Republics and the work accomplished during the fiscal year are described in the following paragraphs.

In Guatemala, base course and paving construction was completed from Los Encuentros to San Cristobal, a distance of 39 miles, and 8 bridges were completed. The highway was passable at all times for its full length of 313 miles, of which 161 miles were paved and 152 miles had an all-weather gravel surface.

In El Salvador, the highway was completed throughout the country.

In Honduras, the highway was completed during the year and was paved for its full length of 94 miles.

In Nicaragua, the highway was completed during the year except for a 28-mile section between Nandaime and Rivas, paved many years ago, which now needs repairing and resurfacing. The balance of 210 miles in Nicaragua has a good paved surface.

In Costa Rica, work progressed on the construction of 39 bridges between San Isidro and the Panama border. These were scheduled for completion late in 1962. During the year repairs were made on the 68-mile highway section from Las Canas to San Ramon, and plans were made for paving the unpaved sections.

In Panama, the 17-mile section from the Costa Rica border to Concepcion was paved with concrete. Concrete paving was also begun on the 37-mile section between Puerto Escondido and Guabala. Work progressed slowly on the 62-mile cut-off between Guabala and Santiago. Some 35 miles of grading, drainage, subbase work, and several bridges were under construction. At the end of the year this work was nearly complete. Four bridges were under construction

between Puerto Escondido and Guabala. The highway was passable at all times in Panama, since the old road was being used where the 62-mile cut-off was under construction.

Other Central American projects

In Guatemala, Public Roads continued furnishing technical engineering assistance to the Agency for International Development in connection with the construction and improvement of the Pacific Highway from the Mexican border to the border of El Salvador, and a rural development road program.

In Nicaragua, the United States was assisting financially in the construction of the Rama Road, which will form the main transportation link between the settled portions of Nicaragua on the Pacific coast and the large undeveloped fertile areas of eastern Nicaragua and the Atlantic Ocean. The 155-mile route extends eastward from San Benito on the Inter-American Highway to Rama, a potential river port on the Escondido River. Between 1943 and 1948 an all-weather road was completed from San Benito to Villa Somoza, a distance of 92 miles. Work was resumed in 1955, and since then 58 miles of construction have been put under contract, including 15 bridges, of which 48 miles were completed.

Nicaragua has begun a program of construction and repair on secondary and farm-to-market roads, with the aid of loans from the Export-Import Bank and the Agency for International Development. At the request of Nicaragua, Public Roads agreed to furnish a supervising engineer and necessary engineering and accounting assistants to aid in this program.

In Costa Rica, an equipment specialist continued to assist in the purchase and maintenance of construction equipment and training of operators, and an engineer aided in the supervision of construction of the San Jose–El Coco Airport being financed with a loan from the Export-Import Bank. During the year Costa Rica obtained a World Bank loan for the construction and improvement of a national system of highways referred to as the Plan Vial. At the request of Costa Rica, Public Roads agreed to furnish five engineers and technicians to cooperate in the carrying out of the program.

In Panama, three equipment specialists continued to assist in the operation and maintenance of construction equipment and the training of operators.

A highway through the Darien Gap, the last impassable section of the Pan American Highway System, stretching 450 miles through the jungles of southern Panama and northern Colombia, came a step nearer realization with the allocation of $2 million by the Agency for International Development to the Organization of American States for the survey and preparation of plans for this section. When completed, it will provide the first means of land communication between North and South America. An additional $1 million is to be furnished by the member countries of the OAS. The Bureau of Public Roads was cooperating with the OAS, through the Pan American Union and the Darien Gap Subcommittee of the Pan American Highway Congress, in getting the survey underway, and will actively participate in its supervision.

Other foreign aid activities

Since the end of World War II the Bureau of Public Roads has provided technical assistance, advice, and consultation to many foreign countries in cooperation with the Department of State, the Export-Import Bank, and the International Bank for Reconstruction and Development (World Bank). The objectives of such assistance have been to develop and further the programs of highway improvement and communications in those countries, thus fostering their economic and social growth. Emphasis has been given to aiding the

countries to establish competent highway organizations and to train nationals to staff them.

Public Roads actively participated in such programs in 15 countries during fiscal year 1962. Programs in 13 of these—Cambodia, Colombia, Jordan, Laos, Lebanon, Liberia, Nepal, Peru, the Philippines, Spain, Sudan, Turkey, and Yemen—were sponsored by the U.S. Agency for International Development (AID). The programs in Ethiopia and Iran were respectively financed by loans from the World Bank and the Export-Import Bank.

The assistance programs carried on during the fiscal year were all continuations of programs begun in previous years. The programs in Lebanon, Liberia, and Spain were phased out on June 30, 1962, so far as AID sponsorship was concerned, but the programs in Lebanon and Spain were being continued under the auspices of the respective national governments.

Cambodia.—Public Roads activities in Cambodia during the year were concerned with the rehabilitation and maintenance of the Khmer–American Friendship Highway, connecting the capital, Phnom Penh, with the port city of Sihanoukville on the Gulf of Siam. The Public Roads staff of 14 men completed materials testing and other field engineering work, and prepared contract plans and specifications for the rehabilitation of this 133-mile highway. It was expected that construction would start in November 1962. All maintenance work on this highway was under Public Roads supervision. A seal coat was applied to two-thirds of the highway to protect the roadway from heavy monsoon rains. One half-mile section, damaged by landslides, was reconstructed. Training of Cambodian technicians in material testing was continued and implemented by field experience. Equipment rehabilitation work progressed, and Cambodian personnel were trained in equipment maintenance and operation.

Colombia.—Continuing activities begun in 1961 at the request of AID and the Colombian Government, a Public Roads engineer provided technical advice and assistance of wide scope to the Ministry of Public Works throughout the year. Help was also given in the establishment and operation of the Pan American Highway Training Center for equipment operators in Bahia Solano, for which the United States provided $250,000 worth of construction equipment. A highway transportation division was established in the AID Mission in Colombia and the Public Roads engineer served as its highway advisor.

Ethiopia.—The contract between the Bureau of Public Roads and Ethiopia, through which Public Roads provides principal management personnel to the Ethiopian Imperial Highway Authority, was in its 12th year. At the close of the year 18 Public Roads engineers and administrative personnel were in Ethiopia. The salaries and other costs of 16 were being paid by Ethiopia, the other 2 being financed by AID.

During the year 45 miles of road were constructed by contract and 65 miles were built by the Highway Authority's own forces. These additions to the designated primary system brought the total of all-weather, regularly maintained roads to approximately 3,000 miles. In addition, 75 miles of dry-weather roads were kept in traversable condition during the dry season, pending their reconstruction.

A notable accomplishment of the year was the virtual completion of the 480-foot-long Blue Nile Gorge viaduct and its approaches, near Lake Tana, source of the Nile. An unusual structure for this part of the world, the concrete deck on concrete piers features a reverse curve accommodated to the difficult terrain and foundation conditions. The 23½-mile project, estimated to cost $3 million, was being built by an Italian firm. The previously constructed main bridge over the Blue Nile is 864 feet long, including a 623-foot main arch span.

Iran.—Public Roads technical advice and assistance to the Ministry of Roads in Iran was carried on through a 2-year, $3.5 million Export-Import Bank loan,

earmarked largely for equipment and spare parts. Public Roads work in Iran was primarily centered in a maintenance program, although considerable effort was spent in organizing and training a highway department, including divisions of design, construction, and programing and planning, and a testing laboratory. Public Roads assisted in the operation of training schools for equipment mechanics and operators at which 200 students completed courses.

Iran has been trying to put as much of its 16,000-mile road system under machine maintenance as possible. Preventive maintenance was stressed. Some 4,400 miles were being maintained by machinery, the remainder by hand labor. During the year the Ministry of Roads surface treated 180 miles of roads, using its own equipment.

During the year a highway sign shop was put in operation and some 3,000 highway signs were erected. These were designed according to the 1954 Geneva Conference standards.

Forty Public Roads personnel were in Iran, about half in Tehran and the rest stationed throughout the country.

Jordan.—During the fiscal year Public Roads, in cooperation with AID, continued technical assistance to the Government of Jordan's Ministry of Public Works in highway and bridge design, construction, maintenance, materials testing, and the repair and maintenance of highway equipment. Public Roads personnel also worked closely with the Ministry in the formation and staffing of an integrated highway organization.

During the year 20 miles of crushed rock base were placed, primed, and sealed, and a 2-mile demonstration pavement was completed at the entrance to Amman. Construction by contract and day labor continued on the Jerusalem–Dead Sea highway, which was scheduled for completion by December 1962. Construction was completed on 6½ miles of crushed stone base, prime, and seal highway from near Wadi Musa to Petra. All maintenance equipment for the Amman District was received during the year, and the training of personnel in mechanized highway maintenance was started and continued through the year with good results.

The Public Roads 13-man staff in Jordan was reduced to 9 by the end of the year.

Laos.—During the year Public Roads continued the assistance program in Laos initiated in 1959, but operations were handicapped by increasingly unsettled conditions which resulted in some shifting of the program and the use of equipment, personnel, and supplies, and in increasing costs for local supplies and labor. The Public Roads staff consisted of only 3 men during most of the period, but at the close of the year the political situation was such that AID had agreed to increasing the staff to 14.

Construction was completed during the year on 23 miles of primary routes and on 22 miles of important secondary routes. Ten wooden bridges were reconstructed, and several bridges which had been washed out or damaged were reconstructed. The large stock of Bailey Bridge components stored at Bangkok was moved to a storage area at Korat in Thailand, along with 12 power cranes.

Shops at the principal repair center were greatly improved during the year, and most of the heavy shop equipment was installed. The repair of road equipment was progressing at a much faster rate than formerly, the receipt of repair parts and tools being the limiting factor. Subdivision shops were also improved, and an extensive training program in repair and warehousing activities was in progress.

Lebanon.—The fiscal year was the fourth year of Bureau of Public Roads activities in Lebanon. During the year the Lebanese Highway Department received no new economic assistance funds from AID other than a hold-over amount of P.L. 480 (surplus grain) funds, earmarked for labor costs in drought-stricken areas.

The Public Roads staff made a detailed study of the highway department's design and field survey activities, recommending ways to increase production and to take care of current work and build up a stockpile of plans for the future. Continued assistance was given in the planning and construction of freeways connecting major centers of population along the coastal area. Promotion of the activities of the materials laboratory was also continued, and other sections of the highway department were given a better understanding of its value and capabilities. Training continued at the central highway equipment shop. Specifications were prepared for new equipment to be purchased by the Government of Lebanon. Two manuals were jointly prepared and printed, one dealing with testing of highway materials and the other a modification of the AASHO *Policy on Geometric Design*, converted to the metric system.

The Public Roads staff of six was reduced to two at the end of the year. Although the AID program in Lebanon was phased out on June 30, 1962, an agreement was completed between the Government of Lebanon and AID to keep two Public Roads engineers in Lebanon during fiscal year 1963 at the expense of the Government of Lebanon.

Liberia.—The Public Roads assistance program in Liberia, which began in 1952, was terminated on June 30, 1962. Liberia enacted legislation during the year to reorganize its government departments, and the functions of the existing Division of Highways will be distributed among several divisions in the reorganized Department of Public Works and Utilities.

Highway construction continued during the year, opening new areas and aiding in the economic development of the country. Equipment for road construction under the Liberian rural area development program arrived during the year, and 12 miles of road were built with it. Only routine maintenance was performed during the year, and excessive equipment downtime greatly reduced the effectiveness of the maintenance crews. Routine testing of aggregates and concrete samples continued, but at a much reduced rate, and shop activities were curtailed during the year by a lack of funds for parts.

During the year three Liberians returned from training in the United States—a materials technician, an asphalt maintenance foreman, and an automotive mechanic. At the end of the year four Liberians were in the United States studying civil engineering, two under AID sponsorship and two sponsored by the Liberian Government.

Nepal.—Public Roads has been furnishing technical assistance to the Government of Nepal in highway improvement since 1958 under a joint agreement among the Governments of Nepal, India, and the United States. The program involved improvement of existing roads and construction of others totaling over 800 miles, and training of a Nepalese staff in modern highway procedures. Throughout the fiscal year efforts of the seven-man Public Roads staff were concentrated largely on scattered construction work on low-standard projects, designed and located to improve existing rural routes and to open up new areas. At the end of the fiscal year negotiations were underway to concentrate road construction in a more limited area, with more emphasis on the training of Nepali for future highway activities.

Peru.—Since November 1960 Public Roads has assisted the Government of Peru in planning and implementing highway projects being financed with $26.3 million in loans from AID and the Export-Import Bank. Construction was started during the year on projects totaling 176 miles, and an additional 347 miles of roads were being designed. As part of the loan program Public Roads advised on the selection of highway construction equipment costing $1.4 million. The Public Roads staff also assisted the AID emergency highway program in the Department (province) of Puno where drought conditions were severe. As a

relief measure, 5,000 laborers were employed on the construction of 220 miles of roads. Two Public Roads engineers were in Peru approximately half of the year, with one remaining in Lima at the end of the year.

The Philippines.—Three Public Roads advisors provided under a 1960 agreement were in the Philippines by October 1961. These advisors were helping to implement a new highway program financed in part by a loan from the Development Loan Fund of up to $18.75 million for procuring equipment, materials, and equipment repair parts for highway and bridge projects and the rehabilitation of existing equipment. The Philippine Government was investing an equivalent amount in the total undertaking.

By the end of the year, 87 bridge plans had been reviewed and plans for widening and resurfacing of 18 miles of 2-lane roadway and the construction of about 29 miles of new 4-lane freeways were reviewed and approved. Some $2.2 million worth of equipment and spare parts, $1.4 million worth of bridge and roadway materials, and $4.2 million worth of repair parts for construction equipment rehabilitation had been certified as eligible for procurement under terms of the loan and subsequently financed. About 70 percent of the total value of items financed had been procured.

Spain.—The Public Roads technical assistance program in Spain under the Mutual Security Act ended on June 30, 1962, but the program was being continued for another year with financing by the Direccion General de Carreteras. Under this project the four Public Roads engineers in Spain at the end of the year will remain during fiscal year 1963 and will continue to furnish guidance and assistance in highway organization and administration, planning and traffic, maintenance, and urban planning and design.

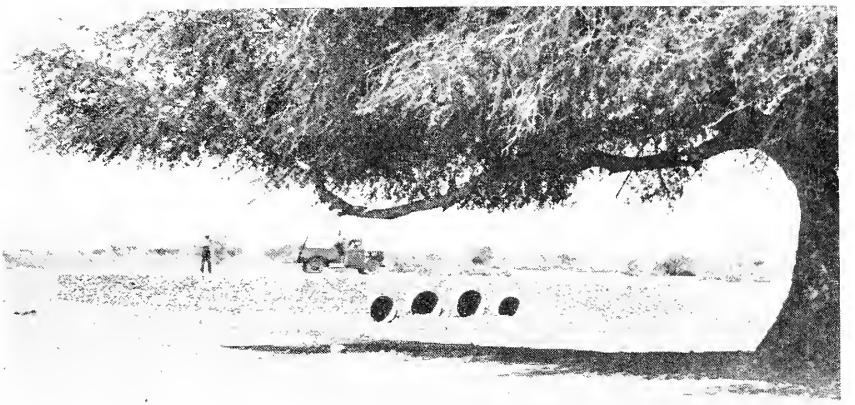
During the year a study of the existing Spanish highway organization was undertaken, and a number of desirable improvements were effected. Planning and traffic activities were concentrated on completion of a highway inventory and on preparation of the Plan General de Carreteras, which furnished the basis for the 16-year program of highway improvement required by law. Urban planning and design assistance was devoted largely to the improvement of procedures and standards. A plan for establishing maintenance control sections was developed and was being put into effect.

Four Spanish engineers spent 3 months in the United States studying maintenance organization, operation, and methods, and a fifth engineer was sent to the United States for training in accounting procedures.

Sudan.—The Public Roads program started in the Sudan in 1957 was continued throughout the year, with Public Roads engineers and equipment specialists furnishing technical advice and training to Ministry of Works technicians in highway design, construction, and maintenance and in equipment operation and maintenance. Ten Public Roads personnel were in the Sudan at the end of the year.

A project designed to strengthen planning functions was initiated during the year. Also, a second maintenance demonstration project was begun to provide a 22-mile all-weather route between Khartoum and Jebel Aulia Dam on the White Nile. Construction of the 18-mile Khartoum–North Habbashi Station demonstration project was virtually complete at the end of the year, and traffic using the road was almost triple that on the former dirt track. Construction of the 110-mile Khartoum–Wad Medani project was still being deferred at the end of the year, pending approval of final contract documents.

Public Roads personnel made field inspections and provided technical liaison between the Sudan Government, AID, and a consulting firm, which completed a feasibility study of a proposed highway linking the capital to the country's principal port-of-entry at Port Sudan. An equipment specialist was assigned to



Culvert installation on the highway north of Khartoum, in the Sudan.

Juba to advise Sudanese personnel in the operation, maintenance, and repair of construction and shop equipment and in proper highway maintenance operations in the southern provinces.

In addition to various phases of on-the-job training being carried on, 13 Sudanese were sent abroad for observation tours and practical training in modern highway engineering practices. Some of these individuals had already returned to responsible posts in their respective Ministries.

Turkey.—The Public Roads specialist assigned to Turkey to assist in the installation of an electronic computer and in the development of a program for its use completed his 1-year assignment in April 1961, but returned to Turkey in October to assist in developing further applications for the computer. The computer is now in actual productive use 60 percent of the time. It is being used in highway planning and programing, highway and bridge design, construction, and finance and adminstration, including processing the monthly payrolls for 25,000 employees and general cost distribution. Procedures were being developed at the end of the year to utilize the computer for controlling the huge inventory of highway equipment parts and supplies maintained by the Turkish Directorate of Highways.

Yemen.—At the close of the year, 1,075 Yemeni employees were being supervised by 41 Public Roads engineers and technicians and 15 third country nationals. Construction was completed during the year on 70 miles of the 260-mile Mocha-Taiz-Sanaa road project at a cost of $47,000 per mile. The Mocha-Taiz section will be completed early next year and work on the Taiz–Sanaa section was well underway. Travel time between the Port of Mocha and Taiz had been reduced from 6 hours to 3 for commercial trucks, and upon completion of the Mocha-Taiz section it should be reduced to 2½ hours.

Plans were underway for development of a maintenance section in the Ministry of Public Works, to take over maintenance of the Mocha-Taiz road as soon as it is completed. Also, an extensive training program was being carried on to train Yemeni personnel in highway construction and maintenance techniques for the nucleus of a future highway department for the Government of Yemen.

Foreign study programs

Study, observation, and training programs of foreign engineers during fiscal year 1962 did not reach the peak of the previous year. The Bureau of Public

Roads, through the cooperation of the States, counties, cities, and industry, arranged programs for 221 foreign highway officials, engineers, and technicians from 50 countries. These visitors were provided with 603 man-months of study. The majority of visitors were sponsored by the Agency for International Development. Others were referred to Public Roads through the Bureau of Educational and Cultural Exchange of the Department of State, the United Nations, private foundations, and by their own governments. Twenty-two foreign engineers, representing 10 countries, began the second group program in Ohio during March 1962. The first such program, inaugurated during fiscal year 1961 and concluded in September 1961, proved very successful. Similar group programs were being planned in other States during the fiscal year.

Through the Cultural Exchange Program of the Department of State, arrangements were made for an exchange of engineers between the United States and the USSR. Nine U.S. engineers headed by F. C. Turner, Assistant Federal Highway Administrator and Chief Engineer of the Bureau of Public Roads, visited Russia in September 1961. In return, a team of 10 USSR engineers toured the United States in October 1961, visiting the Bureau of Public Roads and highway construction projects in 10 States.

Appendix

LIST OF TABLES

Table 1.—Summaries of programs approved and work completed in the fiscal year 1962, by class of highway and by fund

	PROGRAMS APPROVED [1]						WORK COMPLETED					
	Total cost	Federal funds	Miles	Railway-highway grade-crossing improvements			Total cost	Federal funds	Miles	Railway-highway grade-crossing improvements		
				Crossings eliminated	Structures reconstructed	Crossings protected				Crossings eliminated	Structures reconstructed	Crossings protected
	BY CLASS OF HIGHWAY						BY CLASS OF HIGHWAY					
Primary rural:												
Interstate	$1,941,295,956	$1,621,553,270	4,979.5	117	43	24	$978,519,388	$876,778,680	2,335.5	122	6	3
All other	466,160,432	246,700,248	3,065.2	42	12	36	637,028,233	331,808,960	5,219.5	89	7	73
Secondary rural	499,424,042	260,292,483	11,611.0	30	20	209	464,417,239	240,131,891	12,601.9	49	3	228
Urban:												
Interstate	1,122,404,191	914,992,788	407.7	80		6	807,946,675	713,596,090	335.0	79	1	3
All other	599,445,195	302,646,493	543.8	81	23	43	419,673,202	223,447,818	554.0	90	27	70
Subtotal	4,628,729,816	3,346,185,282	20,607.2	350	98	318	3,307,584,737	2,385,763,439	21,045.9	429	44	377
Not classified [2]	120,515,909	113,595,064	3,651.9	3		2	93,482,296	89,314,834	2,164.8	2	2	3
Total	4,749,245,725	3,459,780,346	24,259.1	353	98	320	3,401,067,033	2,475,078,273	23,210.7	431	46	380
	BY FUND						BY FUND					
Federal aid:												
Primary	$803,139,096	$425,338,471	5,049.8	77	56	56	$688,210,343	$359,009,829	5,376.7	104	10	89
Secondary	541,155,142	282,774,358	11,770.2	31	21	218	478,714,514	247,311,260	12,613.7	52	3	229
Urban	525,789,888	264,384,805	411.6	75	17	31	352,331,699	188,018,855	377.1	71	24	53
Interstate	2,758,645,690	2,373,687,648	3,375.6	167	4	13	1,786,131,586	1,590,045,661	2,654.5	201	7	6
"D" funds [3]							2,196,595	1,377,834	23.9	1		
Subtotal	4,628,729,816	3,346,185,282	20,607.2	350	98	318	3,307,584,737	2,385,763,439	21,045.9	429	44	377

Defense access roads	20,408,869	20,098,589	2,317.7	3		2	15,629,382	15,584,954	1,234.7	1		1
National forest highway [4]	57,690,726	55,891,051	769.2				28,838,591	27,370,483	493.8	1		
National park and parkway [5]	25,410,800	25,410,800	138.8				19,900,715	19,900,715	199.9			
Bureau of Land Management [5]	([6])	([6])	([6])				4,935,776	4,935,776	128.8			
Forest development [5]	([6])	([6])	([6])				511,455	511,455	3.9			
National Science Foundation, Kitt Peak Observatory Road [4]							2,823,295	2,823,295	12.1		1	1
Woodrow Wilson Memorial Bridge [4]							13,176,139	13,176,139	1.1			
Public lands	5,625,095	4,987,847	89.5				2,106,547	1,740,616	26.0			
Emergency flood relief	11,380,419	7,206,777	336.7				5,465,582	3,176,587	64.5		1	1
Subtotal	120,515,909	113,595,064	3,651.9	3		2	93,387,482	89,220,020	2,164.8	2	2	3
Total	4,749,245,725	3,459,780,346	24,259.1	353	98	320	3,400,972,219	2,474,983,459	23,210.7	431	46	380

[1] Initial commitment of funds.

[2] Defense access roads, forest, park, Bureau of Land Management, forest development, National Science Foundation (Kitt Peak Observatory Road), Woodrow Wilson Memorial Bridge, public lands, and emergency flood relief projects.

[3] Provided by sees. 2(a) and 2(e) of the Federal-Aid Highway Act of 1958. In subsequent tables, work completed with these funds is included in data for the primary, secondary, and urban programs.

[4] Includes construction projects only.

[5] Construction supervised by Bureau of Public Roads.

[6] Data not available.

Table 2.—Projects under construction or plans approved on June 30, 1962, by class of highway and by fund

	Total cost	Federal funds	Miles	Railway-highway grade-crossing improvements		
				Crossings eliminated	Structures reconstructed	Crossings protected
By Class of Highway						
Primary rural:						
Interstate	$3,145,071,909	$2,784,487,057	5,041.6	216	8	13
All other	1,369,682,065	725,851,541	7,623.0	156	61	103
Secondary rural	859,096,553	453,331,640	16,804.6	64	20	344
Urban:						
Interstate	3,659,543,951	3,079,412,965	802.5	208	3	7
All other	1,345,875,759	684,588,981	1,044.5	199	43	77
Subtotal	10,379,270,237	7,727,672,184	31,316.2	843	135	544
Not classified [1]	169,571,758	160,198,696	3,211.0	5	10	1
Total	10,548,841,995	7,887,870,880	34,527.2	848	145	545
By Fund						
Federal-aid:						
Primary	1,479,464,984	782,973,383	7,804.7	171	66	119
Secondary	921,582,774	484,336,733	16,916.9	68	21	353
Urban	1,174,325,309	597,180,736	755.8	181	37	52
Interstate	6,803,897,170	5,863,181,332	5,838.8	423	11	20
Subtotal	10,379,270,237	7,727,672,184	31,316.2	843	135	544
Defense access roads	24,289,179	23,793,755	1,368.9	5	10	1
National forest highway [2]	69,370,796	67,175,773	870.0			
National park and parkway [3]	45,535,160	45,535,160	314.7			
Bureau of Land Management [3]	7,054,402	7,054,402	162.8			
Forest development [3]	2,192,175	2,192,175	26.3			
Woodrow Wilson Memorial Bridge [3]	94,814	94,814				
Public lands	4,816,869	4,306,536	105.7			
Emergency flood relief	16,313,177	10,140,895	362.6			
Subtotal	169,666,572	160,293,510	3,211.0	5	10	1
Total	10,548,936,809	7,887,965,694	34,527.2	848	145	545

[1] Defense access roads, forest, park, Bureau of Land Management, forest development, Woodrow Wilson Memorial Bridge, public lands, and emergency flood-relief projects.

[2] Includes construction projects only.

[3] Construction supervised by Bureau of Public Roads.

Table 19.—Mileage of highway construction in national monuments, parks, and parkways, under direct supervision of the Bureau of Public Roads during fiscal year 1962

Monument, park, or parkway (and State)	Completed during fiscal year	Under construction as of June 30, 1962
MONUMENTS:		
Capitol Reef (Utah)	----	5.7
Dinosaur (Utah–Colo.)	----	14.8
PARKS:		
Acadia (Maine)	----	5.2
Bryce Canyon (Utah)	4.8	----
Carlsbad Caverns (N. Mex.)	6.3	----
Crater Lake (Oreg.)	----	12.6
Glacier (Mont.)	----	20.6
Grand Canyon (Ariz.)	----	28.0
Grand Teton (Wyo.)	22.7	1.0
Great Smoky Mountains (N.C.–Tenn.)	7.2	12.2
Hawaii (Hawaii)	4.8	----
Mammoth Cave (Ky.)	----	14.7
Mt. McKinley (Alaska)	22.2	12.8
Mt. Rainier (Wash.)	3.9	9.0
Olympic (Wash.)	6.3	----
Petersburg Military (Va.)	----	1.1
Sequoia–Kings Canyon (Calif.)	15.9	----
Shenandoah (Va.)	.4	----
Theodore Roosevelt Memorial (N. Dak.)	6.9	----
Vicksburg Military (Miss.)	----	4.2
Yellowstone (Wyo.)	5.1	22.3
Yosemite (Calif.)	20.1	3.7
PARKWAYS:		
Blue Ridge (Va.–N.C.)	15.9	84.1
Colonial (Va.)	----	.1
Foothills (Tenn.)	11.7	3.9
George Washington Memorial (Md.–Va.)	3.3	9.2
Natchez Trace (Ala.–Miss.–Tenn.)	42.4	47.6
Rock Creek and Potomac (D.C.)	----	.7
Total	199.9	313.5

Table 3.—Projects financed with Federal-aid funds programed [1] during the fiscal year ended June 30, 1962, by State

State or Territory	Primary			Secondary			Urban			Interstate			Total		
	Total cost	Federal funds	Miles	Total cost	Federal funds	Miles	Total cost	Federal funds	Miles	Total cost	Federal funds	Miles	Total cost	Federal funds	Miles
Alabama	$13,009,164	$6,659,026	45.5	$14,229,326	$6,952,164	505.3	$5,002,557	$2,540,464	3.9	$53,701,450	$31,242,776	54.7	$85,943,497	$47,394,430	609.4
Alaska	25,492,467	21,316,883	143.6	13,349,852	10,934,188	131.5	120,413	106,174					38,962,732	32,357,245	275.1
Arizona	7,763,483	6,094,113	72.6	6,614,171	4,755,231	72.0	1,206,991	920,384	4.2	56,072,338	53,064,331	128.8	71,656,983	64,834,059	277.6
Arkansas	15,903,044	7,747,031	114.4	16,102,836	8,006,477	336.3	4,546,620	2,499,374	22.0	35,620,417	32,061,481	73.9	72,172,917	50,314,363	546.6
California	28,271,892	15,816,912	15.9	17,635,240	10,082,491	176.3	34,311,945	19,431,542	14.7	265,582,937	196,132,954	156.3	345,802,014	241,463,899	363.2
Colorado	10,913,037	6,121,104	98.2	4,591,767	2,588,425	94.6	5,454,895	3,728,711	12.1	34,451,814	31,443,094	114.1	55,411,513	43,881,334	319.0
Connecticut	290,916	143,900	.8	2,792,389	1,372,749	8.2	22,512,314	11,013,668	1.5	38,919,669	33,188,952	8.5	64,515,288	45,719,269	19.0
Delaware	3,918,664	1,956,832	15.4	2,367,178	1,170,099	21.8	672,674	348,837	1.4	9,646,912	8,762,156	2.0	16,605,428	12,237,924	40.6
Florida	21,804,642	10,987,057	169.6	13,489,591	6,703,419	225.2	4,239,306	2,243,884	6.7	59,254,102	53,300,557	65.3	98,787,641	73,234,917	446.9
Georgia	19,044,843	9,564,494	80.6	14,221,822	7,194,119	274.1	11,451,692	5,741,856	12.0	79,260,694	71,357,293	92.1	123,979,051	93,857,762	458.8
Hawaii	4,770,131	2,359,021	3.3	4,102,104	2,051,052	14.3	5,933,734	2,966,867	1.7	4,603,235	4,142,911		19,409,204	11,519,851	19.3
Idaho	8,945,272	5,655,119	79.3	6,416,403	4,127,397	130.3	1,172,446	748,794	2.5	34,600,797	32,016,817	113.6	51,134,918	42,548,127	325.7
Illinois	25,834,691	13,270,789	130.2	17,922,878	8,933,921	404.6	30,216,940	16,319,339	19.5	117,244,449	104,434,787	96.3	191,218,958	142,958,836	650.6
Indiana	29,827,245	14,927,727	221.9	19,848,927	10,095,515	194.0	12,469,518	6,242,335	9.8	68,120,107	61,308,096	70.2	130,265,797	92,573,673	495.9
Iowa	19,878,643	10,150,815	307.7	13,320,383	6,643,917	553.4	4,082,071	2,115,167	11.0	20,188,461	18,213,430	34.4	57,469,558	37,123,329	907.0
Kansas	21,141,824	10,659,398	260.9	10,212,814	5,162,575	526.5	3,815,834	1,929,665	4.4	25,225,389	22,626,400	71.6	60,395,861	40,378,038	863.4
Kentucky	10,275,052	5,285,895	27.0	12,011,905	5,913,088	116.0	3,979,862	1,986,024	4.5	56,730,551	50,360,660	67.1	82,997,370	63,545,667	214.6
Louisiana	13,288,290	6,536,428	81.1	8,559,248	3,917,040	54.0	6,919,608	3,415,247	7.0	55,091,281	49,580,470	35.5	83,858,427	63,449,185	177.6
Maine	7,203,014	3,765,282	30.2	4,480,664	2,236,712	43.8	3,310,963	2,187,883	2.5	8,748,959	7,830,175	22.5	23,743,600	16,020,052	99.0
Maryland	13,134,933	6,428,233	30.5	2,581,423	1,295,953	47.7	11,413,027	5,923,708	13.4	60,952,499	51,525,956	34.6	88,081,882	65,173,850	126.2
Massachusetts	9,982,927	4,906,675	23.0	2,835,469	1,462,136	8.7	14,317,370	6,776,081	7.6	64,923,701	57,849,328	41.1	92,059,467	70,994,220	80.4
Michigan	31,384,461	15,693,088	243.5	17,499,401	8,906,709	616.6	38,557,662	17,766,685	28.2	100,384,430	90,297,944	120.5	187,825,954	132,664,426	1,008.8
Minnesota	25,299,060	12,140,690	319.2	9,761,060	4,593,760	584.0	10,776,565	3,920,958	10.2	83,215,206	46,041,223	70.6	129,051,891	66,696,631	984.0
Mississippi	12,995,002	6,598,238	127.7	13,484,391	6,314,483	415.0	2,631,985	1,406,009	10.0	33,725,946	30,335,478	107.3	62,837,324	44,654,208	720.0
Missouri	19,092,780	9,167,414	67.1	15,468,664	7,737,431	829.4	13,675,790	6,849,367	5.3	60,873,692	54,587,549	71.0	109,110,926	78,341,761	972.8
Montana	11,226,262	7,407,592	144.8	8,550,628	4,556,068	152.2	2,551,909	1,450,363	7.4	32,096,552	29,448,721	76.5	54,425,351	42,862,754	380.9
Nebraska	13,092,952	6,681,251	126.9	16,342,538	8,279,890	572.7	757,489	369,060	.5	20,324,687	18,210,726	70.8	50,517,666	33,640,927	770.9
Nevada	5,416,575	4,871,165	46.1	2,195,950	1,974,822	47.6	276,000	230,018		14,815,596	14,077,033	33.0	22,704,121	21,153,038	126.7
New Hampshire	3,002,523	1,497,491	10.0	4,205,797	2,100,776	20.1	1,970,598	978,492	4.2	8,377,814	7,541,660	8.2	17,556,732	12,118,419	42.5
New Jersey	8,365,232	4,181,316	16.7	6,060,804	3,007,162	12.6	19,004,593	9,485,696	13.3	86,424,127	75,655,532	25.0	119,854,756	92,329,706	67.6
New Mexico	8,248,621	5,658,171	36.6	6,267,398	4,240,779	88.3	1,458,196	965,723	3.5	36,814,289	34,224,883	100.2	52,788,504	45,089,556	228.6
New York	48,590,730	22,464,625	110.6	19,482,265	9,077,753	78.7	88,102,711	41,158,979	24.1	140,125,640	121,614,444	57.9	296,301,346	194,315,801	271.3

North Carolina	23,788,226	11,888,010	83.3	17,946,592	8,844,176	206.8	5,491,757	2,868,940	12.1	27,478,220	24,730,353	55.3	74,704,795	48,331,479	357.5
North Dakota	9,957,228	4,993,004	211.1	9,649,845	4,813,596	711.1	713,484	619,462	.5	12,022,457	11,057,393	46.0	32,343,014	21,483,455	968.7
Ohio	29,578,573	16,240,455	71.4	17,447,503	9,162,078	108.1	20,323,963	12,408,458	19.0	189,166,665	168,579,517	114.1	256,516,704	206,390,508	312.6
Oklahoma	22,629,601	11,305,542	181.9	13,077,141	6,600,750	390.2	11,113,508	5,372,122	31.7	17,524,152	15,681,993	71.6	64,544,402	38,960,387	675.1
Oregon	10,552,732	6,633,822	41.6	7,764,311	4,821,628	73.7	9,721,522	2,247,072	3.6	41,085,019	34,651,176	58.0	69,123,584	48,353,698	176.9
Pennsylvania	51,358,492	25,656,073	76.9	27,605,018	13,771,509	64.8	27,510,147	13,477,511	9.4	94,552,689	84,789,652	69.4	201,026,346	137,694,745	220.5
Rhode Island	4,718,721	2,359,886	8.8	3,028,155	1,514,627	8.0	5,152,716	2,576,778	.1	18,858,605	16,530,423	6.3	31,758,197	22,981,714	23.2
South Carolina	6,621,029	3,348,924	27.7	8,152,057	4,113,023	476.8	3,669,620	2,022,416	8.7	10,402,866	9,361,923	21.8	28,845,572	18,846,286	535.0
South Dakota	12,163,373	6,728,771	290.5	5,611,000	3,154,869	291.4	996,733	551,391	2.7	9,840,357	8,960,615	24.8	28,611,463	19,395,646	609.4
Tennessee	19,084,874	9,540,366	64.8	13,276,702	6,426,785	448.0	8,630,973	4,621,236	4.1	95,229,304	85,706,344	156.2	136,221,853	106,294,731	673.1
Texas	39,819,461	20,591,170	344.9	31,487,432	15,768,520	768.8	24,016,484	13,364,100	25.9	117,716,792	104,626,700	228.5	213,040,169	154,350,490	1,368.1
Utah	6,100,108	4,727,091	49.0	4,036,173	2,963,670	51.2	518,061	402,530	.8	35,869,007	33,924,097	43.3	46,523,349	42,017,388	144.3
Vermont	4,056,405	2,022,146	10.9	3,596,480	1,794,490	19.9	1,552,155	763,275	3.8	20,704,701	18,634,080	28.3	29,909,741	23,213,991	62.9
Virginia	15,482,300	7,700,893	54.5	12,311,106	6,329,039	168.4	4,416,587	2,228,054	1.0	131,457,227	118,472,677	121.4	163,667,220	134,730,063	345.3
Washington	14,821,155	6,113,891	58.0	8,927,567	4,811,819	147.4	13,645,156	6,682,715	7.6	64,338,705	49,381,919	72.3	101,732,583	66,990,344	285.3
West Virginia	3,203,386	1,443,632	9.9	7,908,971	3,978,551	25.3	4,400,145	2,200,072	1.0	15,282,906	13,745,625	11.0	30,795,408	21,367,880	47.2
Wisconsin	19,407,667	9,646,328	196.7	12,466,131	6,320,742	303.2	6,252,928	3,082,524	4.3	35,963,440	32,453,129	119.0	74,190,166	51,502,723	623.2
Wyoming	8,562,726	5,888,464	61.2	4,383,844	2,601,625	74.7	837,020	550,697	.6	18,793,239	17,447,062	99.2	32,576,829	26,487,848	235.7
District of Columbia	1,582,318	727,451	1.5	642,882	318,606	1.3	1,739,010	832,992	1.6	36,241,598	32,375,743	5.5	40,205,808	34,254,792	9.9
Puerto Rico	2,242,349	1,068,777	4.3	4,830,946	2,275,974	14.7	8,072,641	3,745,106	4.0				15,145,936	7,089,857	23.0
Total	803,139,096	425,338,471	5,049.8	541,155,142	282,774,358	11,770.2	525,789,888	264,384,805	411.6	2,758,645,690	2,373,687,648	3,375.6	4,628,729,816	3,346,185,282	20,607.2

[1] Initial commitment of funds.

Table 4.—Projects involving Federal funds awarded to contract [1] during the fiscal year ended June 30, 1962, by program and by State

State or Territory	Total cost	Total Federal funds	Federal-aid funds				Access funds	Miles
			Primary [2]	Secondary	Urban [3]	Interstate		
Alabama	$71,936,165	$41,266,341	$5,890,957	$9,020,532	$2,771,544	$22,451,450	$1,131,858	743.0
Alaska	30,555,683	24,620,547	16,290,971	8,224,214	105,362			189.3
Arizona	51,209,558	43,583,079	5,646,371	5,467,348	1,806,490	30,576,017	86,853	242.5
Arkansas	67,642,399	44,182,705	11,521,566	9,411,128	1,031,609	21,845,412	372,990	666.0
California	383,318,985	253,152,662	12,792,837	12,974,856	23,931,221	201,934,541	1,519,207	379.0
Colorado	43,044,655	31,910,567	6,952,844	4,621,901	2,778,551	17,352,724	204,547	362.3
Connecticut	65,336,932	46,847,330	43,523	1,372,749	10,609,735	34,821,323		18.3
Delaware	10,154,294	6,497,383	346,975	1,864,295	15,248	4,270,865		26.7
Florida	92,602,476	66,451,154	11,580,820	7,153,912	2,650,254	45,013,608	52,560	518.9
Georgia	117,827,485	87,266,259	7,353,370	10,022,251	6,153,151	63,721,701	15,786	525.2
Hawaii	14,068,681	10,015,879	2,812,678	267,412	146,878	6,788,911		12.3
Idaho	36,514,301	29,305,498	4,655,071	5,727,135	176,342	18,734,724	12,226	366.7
Illinois	217,765,479	165,496,631	11,140,466	11,377,085	16,650,719	126,326,501	1,860	673.7
Indiana	112,659,340	81,209,512	11,126,000	5,890,370	8,359,116	55,827,826	6,200	306.1
Iowa	57,532,246	39,692,857	7,267,153	6,938,993	1,710,356	23,776,355		894.3
Kansas	51,322,761	31,847,383	10,558,758	5,999,513	1,705,770	12,899,172	684,170	1,037.7
Kentucky	89,651,467	66,961,350	5,347,287	8,291,709	1,402,778	51,919,576		287.5
Louisiana	77,307,536	57,700,586	5,901,548	4,249,236	4,288,727	43,232,050	29,025	191.4
Maine	32,682,291	23,154,624	3,184,884	3,760,986	1,504,465	14,679,289	25,000	136.6
Maryland	66,624,954	48,222,818	4,193,633	2,348,968	4,293,032	37,136,051	251,134	147.9
Massachusetts	95,307,768	68,944,115	6,192,949	2,513,893	10,171,633	50,065,640		70.3
Michigan	142,474,453	93,494,479	12,185,658	13,297,448	15,194,860	52,394,513	422,000	1,201.4
Minnesota	77,274,242	54,024,184	11,467,422	4,884,236	3,055,372	34,614,454	2,700	1,011.0
Mississippi	54,258,216	36,372,935	6,263,633	7,352,952	1,353,396	21,290,959	111,995	806.4
Missouri	118,518,988	87,026,294	7,606,593	9,446,619	6,334,874	62,893,393	714,815	1,393.3
Montana	58,144,990	45,785,674	6,445,330	6,746,425	470,358	27,759,656	4,363,905	1,288.8
Nebraska	53,445,217	35,540,434	6,163,145	10,287,268	167,606	18,395,300	527,115	929.7
Nevada	31,856,890	29,705,608	4,921,263	4,873,046	235,797	19,401,559	273,943	219.8
New Hampshire	22,199,768	16,567,094	1,102,859	2,744,737	460,189	11,651,309	608,000	53.7
New Jersey	121,101,824	93,592,738	3,941,316	3,543,962	10,321,804	75,714,123	71,533	78.5
New Mexico	40,855,181	33,140,671	5,276,832	4,874,010	1,073,040	21,916,789		221.6
New York	291,073,023	181,088,217	26,650,545	10,684,044	46,188,069	97,101,971	463,588	314.7

North Carolina	69,606,728	42,740,854	11,006,691	11,218,101	1,881,277	18,634,785		490.8
North Dakota	31,852,927	20,249,609	5,772,008	5,180,113	66,787	8,045,371	1,185,330	1,475.0
Ohio	218,381,096	168,147,806	19,202,644	13,065,806	8,395,821	127,481,535	2,000	309.8
Oklahoma	60,114,826	37,732,352	9,982,347	8,350,337	2,593,843	16,805,825		722.8
Oregon	77,170,803	54,967,283	7,074,286	5,728,275	2,332,952	39,831,770		260.6
Pennsylvania	221,463,751	155,710,208	21,774,482	16,986,006	13,741,836	103,189,419	18,465	271.8
Rhode Island	31,330,162	23,088,769	2,997,455	1,650,812	1,251,778	17,182,724	6,000	30.8
South Carolina	38,142,957	24,859,432	5,450,667	5,338,693	1,666,898	12,403,174		709.6
South Dakota	27,685,324	21,098,689	2,244,269	4,218,180	313,465	13,195,435	1,127,340	775.4
Tennessee	127,082,682	96,024,801	9,589,342	9,398,896	3,613,329	72,441,461	981,773	874.2
Texas	192,955,911	135,702,150	21,152,540	17,153,600	13,032,900	84,321,960	41,150	1,395.4
Utah	35,996,182	31,399,605	6,180,160	3,885,856	898,036	20,424,873	10,680	171.8
Vermont	22,357,355	17,160,738	2,089,099	1,934,567	762,821	12,276,790	97,461	59.1
Virginia	149,863,629	120,697,276	7,528,761	7,698,909	3,534,016	101,266,583	669,007	372.4
Washington	85,951,159	59,525,355	7,156,466	6,491,951	6,142,531	39,685,617	48,790	328.7
West Virginia	26,704,415	17,011,101	1,678,185	5,288,051	1,468,532	8,575,783	550	71.4
Wisconsin	71,444,580	44,580,931	12,195,128	7,562,329	4,349,256	20,328,718	145,500	610.9
Wyoming	37,509,059	30,591,953	5,851,273	3,923,274	554,457	19,877,562	385,387	284.5
District of Columbia	32,022,798	27,168,671	373,194	602,775	414,742	25,777,960		6.7
Puerto Rico	14,382,433	6,714,263	1,563,571	2,955,718	2,108,970		86,004	29.6
Total	4,369,287,025	3,109,839,454	403,687,825	344,865,482	256,242,593	2,088,255,107	16,788,447	24,565.9

[1] Includes preliminary engineering, right-of-way, and force-account projects on which work was started during the fiscal year.

[2] Funds available for either rural or urban portions of the Federal-aid primary highway system.

[3] Funds available for primary system in urban areas or for urban extensions of secondary system.

Table 5.—Status of Federal-aid projects [1] as of June 30, 1962, including projects completed during the fiscal year

State or Territory	Programed,[2] plans not approved			Plans approved, not under construction			Under construction			Completed during fiscal year		
	Total cost	Federal funds	Miles	Total cost	Federal funds	Miles	Total cost	Federal funds	Miles	Total cost	Federal funds	Miles
Alabama	$85,558,365	$53,871,153	119.3	$21,042,518	$16,040,951	88.6	$159,274,352	$110,336,490	875.5	$76,905,085	$49,066,845	697.6
Alaska	41,568,302	39,300,213	428.5	9,318,545	8,591,134	36.6	55,624,089	47,987,688	200.9	7,719,756	6,281,533	163.3
Arizona	43,205,000	40,587,993	116.0	11,406,327	10,238,493	48.3	94,967,851	83,543,994	354.0	19,910,823	16,608,925	95.1
Arkansas	39,837,256	33,304,831	130.1	18,356,180	13,056,935	107.9	145,864,152	106,505,228	943.7	38,626,704	24,432,079	325.2
California	85,419,561	59,110,347	54.4	92,687,804	76,690,963	48.1	1,039,406,992	692,752,804	455.1	231,698,503	183,219,563	282.8
Colorado	22,167,742	18,722,062	98.0	7,142,976	6,073,452	38.9	57,260,773	41,005,788	253.5	45,755,489	31,180,184	427.6
Connecticut	909,000	550,100	.1	517,229	309,441	.9	148,254,838	115,488,190	36.6	55,413,313	39,051,145	60.7
Delaware	11,762,097	8,700,584	21.2	7,291,401	6,152,643	5.5	42,132,700	34,019,756	28.9	2,756,137	1,979,079	3.0
Florida	29,612,635	21,172,596	119.2	18,691,494	15,397,739	78.6	106,898,350	79,099,279	485.1	66,113,737	53,259,936	242.7
Georgia	93,073,923	77,330,174	249.0	42,437,476	31,902,232	110.7	279,604,930	208,554,225	1,030.7	47,242,240	29,679,495	440.6
Hawaii	17,396,048	10,480,824	23.5				15,247,637	10,602,479	10.8	6,011,946	2,982,318	7.8
Idaho	29,264,513	25,913,571	96.9	11,900,054	9,564,545	58.2	51,926,029	42,502,268	421.1	25,695,035	20,710,988	214.6
Illinois	42,039,152	32,686,501	88.0	73,810,344	56,329,372	112.9	470,304,940	364,289,625	878.4	182,496,720	132,197,929	655.9
Indiana	52,520,560	37,806,816	205.3	17,959,514	12,443,766	163.1	202,602,859	150,095,352	310.9	107,868,134	75,958,601	419.3
Iowa	19,783,086	13,791,395	101.4	14,239,676	11,667,884	91.2	87,015,944	60,230,838	1,163.1	52,388,924	34,018,221	876.5
Kansas	19,096,097	14,944,390	128.5	14,929,479	9,494,406	151.4	61,178,313	41,763,879	1,111.9	58,426,076	39,000,222	1,149.3
Kentucky	25,704,569	20,407,707	37.1	27,273,234	22,545,852	33.2	170,589,194	126,511,606	426.9	76,128,078	58,893,901	217.8
Louisiana	40,501,576	34,909,774	35.3	14,163,580	10,713,440	55.6	274,394,656	216,802,003	495.5	49,615,493	33,306,558	232.8
Maine	12,577,946	7,843,838	37.9	11,906,112	10,256,646	28.7	37,880,062	25,574,459	143.0	19,443,112	12,916,157	73.3
Maryland	36,300,530	28,009,432	46.6	22,797,915	15,135,806	38.1	116,618,107	91,354,029	185.9	54,899,343	39,934,906	153.8
Massachusetts	26,590,569	23,290,224	20.1	81,848,573	62,902,099	62.7	190,054,835	135,467,103	100.1	65,025,942	49,368,529	45.3
Michigan	19,635,022	12,055,641	82.3	57,888,432	45,290,105	137.3	315,020,822	237,484,169	1,295.9	176,681,958	125,350,178	868.7
Minnesota	102,022,746	43,845,998	32.4	26,497,005	20,024,490	127.9	217,421,436	172,248,542	1,192.6	97,303,319	63,407,237	1,524.2
Mississippi	43,284,042	35,974,121	165.6	13,597,935	10,528,869	97.2	116,256,356	85,328,316	1,064.5	49,237,348	33,715,932	519.2
Missouri	27,303,933	21,678,094	109.5	34,358,751	23,836,075	97.9	233,938,470	175,398,435	1,341.8	75,201,742	54,666,518	1,004.8
Montana	26,545,917	22,606,654	192.4	10,080,449	8,276,280	94.8	115,889,230	91,964,617	692.2	35,038,756	25,801,673	318.1
Nebraska	27,666,990	23,880,635	137.9	14,528,776	11,799,020	95.0	109,235,394	79,893,641	1,285.1	48,399,236	30,854,020	746.9
Nevada	10,989,744	10,323,477	62.6	9,973,831	9,393,011	39.2	61,045,503	57,222,213	213.2	19,567,869	17,514,742	148.2
New Hampshire	2,328,308	1,203,876	7.3	3,978,882	3,580,990	3.9	40,030,839	30,773,277	63.4	14,374,681	9,754,811	37.3
New Jersey	32,438,606	25,404,041	29.9	64,816,940	53,730,260	29.1	267,807,160	209,913,320	112.5	44,788,192	30,004,708	30.3
New Mexico	25,036,243	22,340,161	61.7	11,552,575	10,244,475	34.7	50,308,296	41,522,942	199.3	35,664,458	27,300,230	232.4
New York	843,040	583,740	29.8	217,852,467	155,904,601	120.1	712,843,792	500,892,312	515.0	219,688,664	150,394,107	308.2

North Carolina	36,923,135	27,196,936	100.6	2,847,467	1,509,641	17.2	124,140,725	82,251,318	584.6	47,973,909	29,721,689	556.1
North Dakota	756,800	482,720	67.9	6,051,145	4,734,875	77.5	35,772,287	23,440,032	942.1	34,654,874	23,149,346	1,052.2
Ohio	49,969,078	43,247,807	50.7	49,309,644	36,092,422	65.4	373,901,832	278,743,681	449.9	173,748,722	132,473,419	221.9
Oklahoma	16,535,078	9,278,611	149.7	24,373,596	14,795,961	194.7	84,801,484	59,080,336	760.1	53,071,492	33,609,997	626.4
Oregon	17,259,055	13,003,900	29.9	20,958,932	12,212,526	59.4	150,812,989	123,864,627	338.0	40,687,434	30,538,169	246.8
Pennsylvania	126,210,518	89,448,794	177.7	46,966,522	31,651,846	52.2	403,111,984	290,020,230	473.9	86,644,432	60,713,595	112.3
Rhode Island	5,007,097	3,334,914	.7	4,634,720	3,877,998	3.6	67,930,497	51,741,200	33.2	6,824,578	3,876,285	13.3
South Carolina	15,917,037	10,697,020	146.0	10,631,356	7,594,542	54.0	86,326,127	59,463,662	1,185.1	41,952,630	30,793,492	584.8
South Dakota	22,312,600	16,366,237	307.2	2,719,101	1,571,281	59.3	51,093,808	41,095,377	634.2	37,452,770	29,950,603	634.1
Tennessee	48,682,339	39,242,925	114.0	27,350,721	23,564,998	60.7	283,187,748	219,499,947	873.3	88,905,912	71,001,721	764.7
Texas	66,698,100	57,666,180	171.7	22,373,900	17,801,700	75.0	314,767,139	229,255,790	1,444.7	246,040,610	185,390,610	1,690.7
Utah	35,222,595	32,850,340	70.2	18,031,164	15,741,110	65.7	60,463,074	53,875,298	203.2	21,293,134	17,896,892	128.1
Vermont	7,709,000	6,938,100	11.7	1,226,922	600,658	2.9	48,281,833	38,555,684	85.3	32,945,724	25,954,712	64.4
Virginia	44,493,467	38,598,842	56.6	20,304,176	16,396,249	59.5	363,086,118	300,480,963	611.0	55,964,919	39,924,582	308.4
Washington	21,958,974	9,529,112	47.8	24,820,145	14,357,422	49.5	162,691,998	124,821,824	328.9	40,693,110	25,391,239	376.6
West Virginia	56,240,724	44,671,997	76.3	8,565,964	6,777,638	14.9	106,599,212	75,086,110	129.5	36,344,711	27,387,319	143.1
Wisconsin	22,332,840	20,246,554	85.2	15,738,678	11,367,240	108.4	109,696,334	71,407,115	578.6	80,194,632	57,125,598	645.1
Wyoming	4,212,958	3,795,228	27.8	6,488,716	5,268,863	24.8	60,965,283	51,144,183	402.9	41,242,165	34,231,405	314.6
District of Columbia	5,454,500	4,141,435	3.6	19,385,805	15,930,914	1.8	90,589,462	69,479,086	12.2	22,437,820	17,816,798	5.3
Puerto Rico	8,290,000	4,145,000	10.3	11,161,202	5,334,529	11.5	25,365,052	11,938,472	64.1	12,424,346	6,004,698	33.7
Total	1,705,169,013	1,297,513,615	4,773.4	1,328,786,350	1,005,298,388	3,294.3	9,050,483,887	6,722,373,796	28,021.9	3,307,584,737	2,385,763,439	21,045.9

[1] Includes projects financed from Federal-aid primary, secondary, urban, and Interstate funds. [2] Intial commitment of funds.

Table 6.—Mileage of Federal-aid highway projects completed during fiscal year 1962, by program and by number of lanes

State or Territory	Primary program			Secondary program [1]	Urban program			Interstate program		
	2 lanes	4 lanes	6 lanes or more		2 lanes	4 lanes	6 lanes or more	2 lanes	4 lanes	6 lanes or more
Alabama	56.4	67.8		471.5	5.7	22.4			73.8	
Alaska	83.7			79.7						
Arizona	28.5	.1		30.4		2.3	1.5	8.2	22.1	2.0
Arkansas	66.2	14.7		225.3	8.5	.3		1.5	5.3	3.3
California		34.5	3.8	128.3		5.1	5.8		53.4	51.8
Colorado	110.6	16.6		223.8	2.0	5.0		10.4	59.3	
Connecticut	8.0	4.2		21.8	.5	4.6	1.0		20.6	
Delaware	2.3	.4								.3
Florida	23.7	29.2		101.8		3.5			81.3	3.3
Georgia	45.5	43.2		314.1	2.0	.4			35.4	
Hawaii	4.3	.7	.6	2.1						
Idaho	53.3	12.8		80.2		1.0		8.3	58.9	
Illinois	130.0	28.0		406.1	4.0	23.8	5.7		47.1	11.3
Indiana	149.7	63.3		128.4		13.9			63.4	.6
Iowa	259.9	3.2		575.1		10.2			26.6	1.5
Kansas	282.1	12.2		771.4		4.2			78.0	1.4
Kentucky	23.6	15.2		83.8		4.3			84.3	6.7
Louisiana	73.9	31.9		106.4	.3	2.6			6.0	11.6
Maine	15.1	.8		37.0	.6	1.1			18.8	
Maryland	8.9	12.6		101.6	3.2	10.3	4.8		7.6	4.9
Massachusetts	5.7	6.9		9.7		.6	1.5		8.4	12.7
Michigan	180.4	36.5	.6	555.7	1.0	4.3	10.3	.4	76.3	3.2
Minnesota	319.2	129.9		1,001.9	3.0	21.8	.5	8.4	40.2	.3
Mississippi	117.2	28.0		296.8	6.5	4.6			66.1	
Missouri	50.3	7.5		886.8	.9	9.8			45.0	4.4
Montana	136.9	7.8		120.0	1.7	1.0		4.3	46.5	
Nebraska	231.6	.4		487.6		.9			20.3	6.0
Nevada	81.3	18.4		19.8		.4			28.4	
New Hampshire	15.1			13.8	.7	1.0			5.3	1.3
New Jersey		6.5		10.6		4.1	4.1			5.0
New Mexico	49.5	12.9		107.4		.4		9.9	52.3	
New York	104.2	21.4		81.8	5.9	24.1	7.1		46.2	17.0

North Carolina	126.3	29.5		337.8	1.5	1.5	.3	4.7	54.6	
North Dakota	177.6	11.5		786.8	.7	1.9			73.7	
Ohio	17.7	14.6		134.5	1.2	7.3	4.5		32.4	9.6
Oklahoma	161.1	46.0		329.2	.5	6.8	1.6		81.3	
Oregon	28.5	12.7	.9	129.6	1.0	3.4	.6	13.0	50.8	6.1
Pennsylvania	13.6	12.0		54.9		8.9	.1		20.4	2.3
Rhode Island		2.7		10.6						
South Carolina	34.0	12.6	.1	456.2		1.6	1.1		79.2	
South Dakota	171.5	2.9		351.5		.9			107.3	
Tennessee	69.7	18.1		542.3		8.4			119.0	5.0
Texas	412.7	178.6	3.9	910.4	.4	14.5	7.3		130.1	33.8
Utah	23.2		.3	62.1		.1	1.5	.1	40.7	.1
Vermont	17.8			28.2					18.4	
Virginia	29.6	24.0		201.1		6.9			46.8	
Washington	45.8	16.9		282.9	1.9	6.0			13.3	9.7
West Virginia	33.0	5.6		72.8	.5	.2			28.6	2.4
Wisconsin	113.8	45.3		338.9	1.2	1.1	1.5		133.6	9.9
Wyoming	65.3	9.0		90.8		2.5		11.7	135.3	
District of Columbia	.1	.4		1.6					2.5	.6
Puerto Rico	.2	8.1		24.2		1.2				
Total	4,258.6	1,118.1	10.2	12,627.1	55.4	261.2	60.8	80.9	2,344.9	228.7

[1] Total mileage completed, principally 2-lane construction.

Table 7.—Lane classification of mileage of Federal-aid highway projects completed during fiscal year 1962, by class of fund

Number of lanes	Mileage					Total lane miles [1]
	Primary	Secondary	Urban	Interstate	Total	
2-lane	4,258.6	[2] 12,627.1	55.4	80.9	17,022.0	34,044.0
4-lane	1,118.1		261.2	2,344.9	3,724.2	14,896.8
6 lanes and over	10.2		60.8	228.7	299.7	1,798.2
Total	5,386.9	12,627.1	377.4	2,654.5	21,045.9	50,739.0

[1] 6-lane and over converted to lane mileage on the basis of 6 lanes. [2] Total mileage completed, principally 2-lane construction.

Table 8.—Apportionment of Federal-aid highway funds authorized for the fiscal year ending June 30, 1963

State or Territory	Primary ($416,250,000)	Secondary ($277,500,000)	Urban ($231,250,000)	Subtotal ($925,000,000)	Interstate ($2,400,000,000)	Total ($3,325,000,000)
Alabama	$7,569,509	$5,818,263	$3,107,018	$16,494,790	$49,509,300	$66,004,090
Alaska	22,074,816	14,815,807	151,740	37,042,363		37,042,363
Arizona	6,762,658	4,397,233	1,727,732	12,887,623	33,606,600	46,494,223
Arkansas	5,639,442	4,528,253	1,259,326	11,427,021	25,050,900	36,477,921
California	22,247,521	10,532,114	25,004,182	57,783,817	228,847,200	286,631,017
Colorado	7,293,440	4,737,764	2,353,025	14,384,229	31,734,300	46,118,529
Connecticut	2,901,563	1,578,988	5,195,280	9,675,831	33,796,200	43,472,031
Delaware	2,055,234	1,370,156	530,571	3,955,961	8,911,200	12,867,161
Florida	8,015,276	4,982,594	5,588,630	18,586,500	49,651,500	68,238,000
Georgia	10,095,166	7,635,512	3,741,469	21,472,147	44,105,700	65,577,847
Hawaii	2,055,234	1,370,156	857,833	4,283,223	18,794,100	23,077,323
Idaho	4,630,210	3,326,774	482,138	8,439,122	11,233,800	19,672,922
Illinois	15,425,095	8,426,519	14,849,013	38,700,627	124,851,600	163,552,227
Indiana	9,222,532	6,678,936	5,185,909	21,087,377	59,273,700	80,361,077
Iowa	9,205,326	6,867,214	2,470,622	18,543,162	30,288,600	48,831,762
Kansas	9,139,087	6,387,530	2,267,788	17,794,405	18,557,100	36,351,505
Kentucky	6,469,942	5,539,143	2,307,267	14,316,352	48,822,000	63,138,352
Louisiana	6,095,886	4,389,890	3,617,533	14,103,309	69,132,900	83,236,209
Maine	2,947,462	2,249,416	784,204	5,981,172	11,304,900	17,286,072
Maryland	4,054,921	2,545,834	4,179,079	10,779,834	43,845,000	54,624,834
Massachusetts	5,424,274	2,448,943	7,964,678	15,837,895	51,286,800	67,124,695
Michigan	12,424,754	7,787,801	10,481,080	30,693,635	93,259,500	123,953,135
Minnesota	10,470,296	7,379,201	3,788,945	21,638,442	61,904,400	83,542,842
Mississippi	6,103,698	5,189,113	1,357,320	12,650,131	29,079,900	41,730,031
Missouri	11,126,223	7,614,648	5,135,818	23,876,689	61,217,100	85,093,789
Montana	7,749,693	5,372,553	529,083	13,651,329	22,396,500	36,047,829
Nebraska	7,589,682	5,402,939	1,332,764	14,325,385	13,983,000	28,308,385
Nevada	4,810,272	3,199,450	348,676	8,358,398	12,063,300	20,421,698
New Hampshire	2,055,234	1,370,156	611,348	4,036,738	10,736,100	14,772,838
New Jersey	6,127,534	2,180,663	9,959,813	18,268,010	62,402,100	80,670,110
New Mexico	7,011,801	4,725,276	1,117,302	12,854,379	23,889,600	36,743,979
New York	18,463,335	7,976,787	26,618,842	53,058,964	113,404,500	166,463,464

North Carolina	9,645,417	8,637,024	3,031,520	21,313,961	19,576,200	40,890,161
North Dakota	4,875,745	3,598,981	406,015	8,880,741	10,570,200	19,450,941
Ohio	14,126,600	8,789,002	13,073,033	35,988,635	163,340,400	199,329,035
Oklahoma	8,350,762	5,810,547	2,549,398	16,710,707	28,795,500	45,506,207
Oregon	6,436,149	4,496,007	1,930,963	12,863,119	41,569,800	54,432,919
Pennsylvania	15,331,618	9,833,029	14,709,478	39,874,125	107,052,900	146,927,025
Rhode Island	2,055,234	1,370,156	1,372,194	4,797,584	8,816,400	13,613,984
South Carolina	5,235,203	4,580,619	1,655,210	11,471,032	20,666,400	32,137,432
South Dakota	5,566,459	4,040,903	420,192	10,027,554	15,713,100	25,740,654
Tennessee	7,731,611	6,146,134	3,292,200	17,169,945	60,316,500	77,486,445
Texas	24,635,880	15,549,197	12,849,266	53,034,343	108,285,300	161,319,643
Utah	5,116,907	3,329,356	1,205,581	9,651,844	34,629,400	44,301,244
Vermont	2,055,234	1,370,156	321,261	3,746,651	16,518,900	20,265,551
Virginia	7,774,678	6,073,963	4,006,905	17,855,546	72,735,300	90,590,846
Washington	6,664,284	4,512,251	3,446,145	14,622,680	49,888,500	64,511,180
West Virginia	3,919,460	3,554,157	1,216,366	8,689,983	36,024,000	44,713,983
Wisconsin	9,109,799	6,431,738	4,471,619	20,013,156	21,164,100	41,177,256
Wyoming	5,022,560	3,412,437	272,701	8,707,698	22,965,300	31,672,998
District of Columbia	2,055,234	1,370,156	1,450,816	4,876,206	34,412,400	39,288,606
Puerto Rico	2,080,925	2,299,811	1,772,394	6,153,130		6,153,130

Table 9.—Federal highway funds paid by Bureau of Public Roads during fiscal year ended June 30, 1962, by program and by State

State or Territory	Primary [1]	Secondary	Urban [2]	Subtotal	Interstate	D fund [3]	L fund [3]	Total
Alabama	$7,060,824	$6,183,646	$6,068,956	$19,313,426	$45,496,436	$108,823	$30,290	$64,948,975
Alaska	7,197,214	6,554,158	376	13,751,748	113,693			13,865,441
Arizona	4,575,630	4,527,616	1,690,704	10,793,950	25,998,267			36,792,217
Arkansas	8,185,507	5,813,091	1,370,643	15,369,241	17,951,526			33,320,767
California	19,824,309	9,156,567	25,941,398	54,922,274	214,590,439			269,512,713
Colorado	8,087,589	5,103,241	1,850,036	15,040,866	16,445,857			31,486,723
Connecticut	2,530,955	1,080,542	2,792,809	6,404,306	27,756,992			34,161,298
Delaware	9,867	164,354	128,204	302,425	4,253,691	133,335	11,988	4,701,439
Florida	6,627,628	3,453,862	1,982,903	12,064,393	30,368,599	145,143	138,516	42,716,651
Georgia	9,531,153	8,138,281	3,721,259	21,390,693	39,018,406	165,635	841,000	61,415,734
Hawaii	2,158,008	440,315	181,139	2,779,462	11,182,657			3,962,119
Idaho	4,551,728	3,517,441	89,238	8,158,407	15,170,030			23,328,437
Illinois	14,449,864	9,663,716	15,025,622	39,139,202	102,685,422			141,824,624
Indiana	12,996,339	3,827,819	8,342,645	25,166,803	42,253,192	35,265	11,755	67,467,015
Iowa	10,796,208	8,224,883	1,680,131	20,701,222	17,762,527			38,463,749
Kansas	9,772,883	6,215,632	1,087,844	17,076,359	19,751,828			36,828,187
Kentucky	5,996,721	4,805,326	2,235,899	13,037,946	45,669,388	66,269	19,365	58,792,968
Louisiana	7,096,322	2,886,470	4,894,123	14,876,915	48,285,585	105,970		63,268,470
Maine	3,112,357	2,384,675	297,826	5,794,858	7,625,605			13,420,463
Maryland	2,929,802	1,377,778	3,400,221	7,707,801	36,627,164	19,320	90	44,354,375
Massachusetts	5,206,593	1,591,129	12,826,686	19,624,408	40,002,087	−38,600	38,600	59,626,495
Michigan	11,037,212	6,235,434	15,376,976	32,649,622	65,934,802	8,892		98,593,316
Minnesota	10,330,716	5,613,790	4,154,745	20,099,251	38,121,384	106,351		58,326,986
Mississippi	6,372,292	4,895,033	1,391,038	12,658,363	22,802,469			35,460,832
Missouri	11,881,801	8,534,710	3,642,665	24,059,176	55,232,922			79,292,098
Montana	6,368,912	5,059,071	334,119	11,762,102	19,310,581	648,819	123,275	31,844,777
Nebraska	6,697,872	5,616,334	1,974,552	14,288,758	14,948,837			29,237,595
Nevada	4,919,638	1,398,392	46,584	6,364,614	8,960,152			15,324,766
New Hampshire	1,731,026	1,174,918	467,004	3,372,948	13,766,077	129,426		17,268,451
New Jersey	2,934,306	2,149,061	6,245,401	11,328,768	58,440,753	96,661	40,714	69,906,896
New Mexico	4,663,667	2,610,287	990,690	8,264,644	12,267,663			20,532,307
New York	16,771,823	6,239,040	30,331,120	53,341,983	88,270,039	51,520		141,663,542

North Carolina	10,521,665	7,011,416	1,241,966	18,775,047	24,185,862			42,960,909
North Dakota	3,397,432	4,419,321	611,495	8,428,248	8,051,228			16,479,476
Ohio	15,304,058	9,939,211	15,235,831	40,479,100	134,303,903	472,823	144,729	175,400,555
Oklahoma	10,372,380	5,661,338	2,104,075	18,137,793	17,117,665	1,232	381	35,257,071
Oregon	8,617,142	3,489,366	1,121,733	13,228,241	33,667,828			46,896,069
Pennsylvania	15,543,955	6,288,787	9,537,284	31,370,026	67,051,332	245,038	116,970	98,783,366
Rhode Island	2,025,511	818,574	215,079	3,059,164	5,432,770			8,491,934
South Carolina	6,996,618	4,157,174	1,501,762	12,655,554	21,697,013			34,352,567
South Dakota	4,327,604	3,697,057	441,691	8,466,352	27,763,483			36,229,835
Tennessee	5,916,973	6,982,879	1,907,162	14,807,014	53,874,928			68,681,942
Texas	22,135,900	16,767,900	9,441,200	48,345,000	80,314,500			128,659,500
Utah	4,797,578	3,213,742	236,520	8,247,840	17,721,107			25,968,947
Vermont	3,118,061	1,595,905	52,037	4,766,003	24,516,719			29,282,722
Virginia	8,722,641	6,647,592	3,288,567	18,658,800	57,178,991	109,993	857	75,948,641
Washington	7,693,298	5,012,145	3,280,925	15,986,368	38,497,249	9,610	11,909	54,505,136
West Virginia	1,873,807	2,900,067	605,773	5,379,647	16,494,991	27,094	12,253	21,913,985
Wisconsin	10,521,515	5,820,060	4,309,896	20,651,471	34,078,988			54,730,459
Wyoming	4,237,998	3,537,908	264,234	8,040,140	18,518,368			26,558,508
District of Columbia	1,225,668	1,286,481	2,008,646	4,520,795	14,647,906			19,168,701
Puerto Rico	1,941,648	629,066	1,128,183	3,698,907		223		3,699,130
Total	385,698,218	244,512,601	219,097,625	849,308,444	1,892,066,208	2,762,535	1,542,692	2,745,679,879

[1] Funds available for either rural or urban portions of the Federal-aid primary highway system.
[2] Funds available for primary system in urban areas or for urban extensions of secondary system.
[3] Provided by secs. 2(a) and 2(e) of the Federal-Aid Highway Act of 1958.

Table 10.—Balances of Federal-aid funds available to States for projects not yet programed, as of June 30, 1962

State or Territory	Primary [1]	Secondary	Urban [2]	Subtotal	Interstate	Total
Alabama	$1,151,072	$1,373,250	$269,908	$2,794,230	$29,040,164	$41,834,394
Alaska	17,186,267	7,621,838	219,308	25,027,413		25,027,413
Arizona	149,547	864,920	1,697,555	2,712,022	322,920	3,034,942
Arkansas	219,763	1,690,315	1,354,884	3,264,962	15,897,078	19,162,040
California	9,435,822	11,068,327	12,174,032	32,678,181	59,383,176	92,061,357
Colorado	6,333,901	4,681,302	1,161,460	12,176,663	18,515,711	30,692,374
Connecticut	4,868,877	1,902,046	4,884,367	11,655,290	1,015,965	12,671,255
Delaware	4,592,447	1,768,744	1,192,220	7,553,411	13,591,743	21,145,154
Florida	3,169,256	4,790,853	10,068,788	18,028,897	32,473,068	50,501,965
Georgia	2,865,019	4,843,719	1,047,733	8,756,471	5,861,973	14,618,444
Hawaii	40,728	1,766,092	41,651	1,848,471	20,140,019	21,988,490
Idaho	986,607	3,416,740	822,712	5,226,059	6,105,169	11,331,228
Illinois	4,784,925	5,025,679	1,594,478	11,405,082	40,573,176	51,978,258
Indiana	773,853	651,546	1,714,765	3,140,164	108,438,317	111,578,481
Iowa	1,048,872	1,382,507	936,386	3,367,765	14,279,766	17,647,531
Kansas	492,179	4,286,548	2,740,599	7,519,326	21,520,952	29,040,278
Kentucky	2,000,954	358,523	2,077,648	4,437,125	7,464,466	11,901,591
Louisiana	199,009	620,384	344,807	1,164,200	28,900,922	30,065,122
Maine	421,820	529,275	695,933	1,647,028	13,188,152	14,835,180
Maryland	2,699,413	3,834,652	1,710,653	8,244,718	65,013,677	73,258,395
Massachusetts	654,582	2,558,610	1,998,385	5,211,577	37,529,252	42,740,829
Michigan	253,391	5,411,204	2,390,847	8,055,442	20,008,358	28,063,800
Minnesota	125,968	3,668,835	690,149	4,484,952	23,332,487	27,817,439
Mississippi	960,064	5,175,833	1,493,261	7,629,158	10,752,252	18,281,410
Missouri	3,755,568	2,572,412	1,087,907	7,415,887	37,823,887	45,239,774
Montana	6,279,517	2,853,570	391,847	9,524,934	39,221,200	48,746,134
Nebraska	3,727,832	664,269	3,327,077	7,719,178	2,264,867	9,984,045
Nevada	2,458,422	3,733,591	718,407	6,910,420	16,493,247	23,403,667
New Hampshire	2,654,494	111,361	496,422	3,262,277	6,268,618	9,530,895
New Jersey	12,834,405	2,140,733	21,470,595	36,445,733	56,947,093	93,392,826
New Mexico	1,938,614	1,085,500	819,976	3,844,090	16,195,382	20,039,472
New York	997,547	7,259,388	1,336,687	9,593,622	2,063,823	11,657,445

North Carolina	2,231,698	9,939,043	3,751,186	15,921,927	10,922,264	26,844,191
North Dakota	646,817	517,251	18,032	1,182,100	18,461,564	19,643,664
Ohio	2,777,144	1,351,858	580,499	4,709,501	10,638,137	15,347,638
Oklahoma	435,027	3,066,362	961,801	4,463,190	34,770,213	39,233,403
Oregon	145,081	1,301,453	750,747	2,197,281	12,254,662	14,451,943
Pennsylvania	1,979,351	1,589,532	15,091,922	18,660,805	89,850,269	108,511,074
Rhode Island	1,459,178	922,905	2,133,209	4,515,292	3,528,002	8,043,294
South Carolina	2,970,524	4,976,301	308,110	8,254,935	10,777,452	19,032,387
South Dakota	1,828,806	4,755,609	374,597	6,959,012	5,711,260	12,670,272
Tennessee	1,976,266	6,329,713	3,052,685	11,358,664	23,675,144	35,033,808
Texas	8,870,662	15,350,149	867,231	25,088,042	53,465,980	78,554,022
Utah	911,286	353,044	1,677,528	2,941,858	6,816,067	9,757,925
Vermont	281,059	307,438	470,942	1,059,439	21,582,218	22,641,657
Virginia	1,162,911	290,126	5,855,718	7,308,755	67,299,841	74,608,596
Washington	1,073,595	2,452,193	425,763	3,951,551	33,058,407	37,009,958
West Virginia	3,918,346	2,607,061	1,269,826	7,795,233	32,071,183	39,866,416
Wisconsin	660,893	6,372,265	2,466,232	9,499,390	17,480,648	26,980,038
Wyoming	296,828	1,039,419	271,035	1,607,282	23,670,546	25,277,828
District of Columbia	4,850,823	3,806,241	979,711	9,636,775	30,050,745	39,687,520
Puerto Rico	4,028,910	4,152,834	1,100,447	9,282,191	----------	9,282,191
Total	142,565,940	171,193,363	125,378,668	439,137,971	1,286,711,482	1,725,849,453

[1] Funds available for either rural or urban portions of the Federal-aid primary system.
[2] Funds available for primary system in urban areas or for urban extensions of secondary system.

Table 11.—National System of Interstate and Defense Highways: Status of improvement as of June 30, 1962

State	Mileage open to traffic								Mileage of work in progress with Interstate funds			Remaining mileage[1]	Total designated system mileage
	Completed to full or acceptable standards			Improved to standards adequate for present traffic			Toll facilities	Total open to traffic	Under construction	Engineering or right-of-way	Total under way		
	With Interstate funds	With other public funds	Total	With Interstate funds	With other public funds	Total							
Alabama	101.2		101.2	19.4	32.1	51.5		152.7	189.6	148.1	337.7	384.4	874.8
Alaska								541.6	22.5	314.0	336.5	282.9	1,161.0
Arizona	242.8	0.1	242.9	110.7	188.0	298.7		43.5	102.9	355.3	458.2	16.1	517.8
Arkansas	40.7		40.7		2.8	2.8							
California	236.9	24.3	261.2	185.5	210.0	395.5	14.0	670.7	163.2	1,102.1	1,265.3	242.2	2,178.2
Colorado	167.9	4.1	172.0	71.5	34.9	106.4		278.4	43.1	150.6	193.7	475.9	948.0
Connecticut	45.4	71.1	116.5	5.3	17.7	23.0	19.5	159.0	28.6	105.8	134.4		293.4
Delaware	0.6		.6	.6		.6	2.3	3.5	5.8	19.6	25.4	11.6	40.5
Florida	138.8	1.5	140.3				42.4	182.7	146.5	162.3	308.8	628.5	1,120.0
Georgia	141.5	17.5	159.0		75.2	75.2		234.2	193.4	77.0	270.4	599.0	1,103.6
Hawaii					5.8	5.8		5.8		7.3	7.3	35.4	48.5
Idaho	90.3		90.3	44.1	37.3	81.4		171.7	98.5	216.9	315.4	125.0	612.1
Illinois	237.8	20.5	258.3	25.2	133.6	158.8	151.3	568.4	116.3	582.8	699.1	319.0	1,586.5
Indiana	135.5		135.5	7.4	2.8	10.2	156.9	302.6	114.2	416.5	530.7	287.6	1,120.9
Iowa	203.5		203.5	21.5		21.5	3.6	228.6	56.5	211.8	268.3	211.7	708.6
Kansas	222.2		222.2	16.0	19.8	35.8	187.1	445.1	4.2	115.3	119.5	236.5	801.1
Kentucky	90.2		90.2	7.9	8.5	16.4	39.6	146.2	88.7	151.0	239.7	310.2	696.1
Louisiana	41.6	3.6	45.2		6.3	6.3		51.5	170.0	207.8	377.8	253.3	682.6
Maine	53.0	1.2	54.2		3.0	3.0	60.3	117.5	28.3	23.3	51.6	142.9	312.0
Maryland	34.1	32.2	66.3	40.4	28.5	68.9	11.3	146.5	19.3	120.0	139.3	67.9	353.7
Massachusetts	59.6	6.0	65.6	.2	27.5	27.7	125.8	219.1	41.8	98.9	140.7	102.6	462.4
Michigan	334.8	126.4	461.2		5.6	5.6	4.4	471.2	259.3	100.2	359.5	247.2	1,077.9
Minnesota	37.9		37.9	55.1	2.3	57.4		95.3	111.9	360.6	472.5	330.3	898.1
Mississippi	42.9		42.9	13.1	13.8	26.9		69.8	223.3	76.4	299.7	308.7	678.2
Missouri	170.4	2.0	172.4	71.2	141.6	212.8	3.2	388.4	150.6	533.7	684.3	32.0	1,104.7
Montana	133.4		133.4					133.4	124.3	336.4	460.7	586.3	1,180.4
Nebraska	57.1		57.1		12.9	12.9	.3	70.3	61.2	241.7	302.9	116.6	489.8
Nevada	78.3		78.3	17.5		17.5		95.8	68.4	159.8	228.2	210.0	534.0

New Hampshire	61.2	----------	61.2	2.0	2.8	4.8	21.6	87.6	18.2	15.7	33.9	92.3	213.8
New Jersey	17.1	11.9	29.0	13.7	14.4	28.1	54.1	111.2	34.6	108.7	143.3	121.4	375.9
New Mexico	211.1	----------	211.1	91.4	----------	91.4	----------	302.5	77.3	191.8	269.1	433.6	1,005.2
New York	165.1	50.0	215.1	16.1	7.8	23.9	505.6	744.6	116.3	146.7	263.0	219.6	1,227.2
North Carolina	264.0	----------	264.0	38.8	52.0	90.8	----------	354.8	75.7	158.3	234.0	180.0	768.8
North Dakota	163.7	----------	163.7	28.2	11.2	39.4	----------	203.1	43.1	96.7	139.8	225.0	567.9
Ohio	324.3	19.8	344.1	20.4	66.7	87.1	207.5	638.7	126.0	536.7	662.7	193.8	1,495.2
Oklahoma	136.5	----------	136.5	25.3	24.6	49.9	174.3	360.7	103.8	148.9	252.7	180.6	794.0
Oregon	237.2	25.1	262.3	27.5	178.4	205.9	.8	469.0	80.7	10.3	91.0	171.3	731.3
Pennsylvania	238.1	54.5	292.6	----------	1.7	1.7	362.1	656.4	164.8	418.5	583.3	335.8	1,575.5
Rhode Island	10.7	9.7	20.4	.2	.1	.3	----------	20.7	5.3	16.6	21.9	28.3	70.9
South Carolina	216.5	----------	216.5	20.5	7.9	28.4	----------	244.9	90.0	67.3	157.3	276.7	678.9
South Dakota	111.9	----------	111.9	56.2	----------	56.2	----------	168.1	83.1	171.1	254.2	256.5	678.8
Tennessee	69.1	1.7	70.8	8.5	----------	8.5	----------	79.3	233.0	310.9	543.9	424.4	1,047.6
Texas	701.2	52.4	753.6	99.4	135.7	235.1	29.8	1,018.5	269.6	1,052.7	1,322.3	685.7	3,026.5
Utah	57.1	----------	57.1	16.1	1.9	18.0	----------	75.1	68.0	289.0	357.0	502.8	934.9
Vermont	41.5	----------	41.5	----------	----------	----------	----------	41.5	32.2	79.0	111.2	171.2	323.9
Virginia	73.5	31.9	105.4	20.9	37.6	58.5	37.3	201.2	195.2	107.8	303.0	548.9	1,053.1
Washington	72.3	8.3	80.6	138.5	54.4	192.9	.3	273.8	72.5	247.2	319.7	132.1	725.6
West Virginia	29.5	----------	29.5	----------	----------	----------	85.9	115.4	39.0	78.3	117.3	290.0	522.7
Wisconsin	168.1	----------	168.1	----------	39.5	39.5	----------	207.6	48.0	196.9	244.9	----------	452.5
Wyoming	140.7	----------	140.7	38.4	----------	38.4	----------	179.1	188.0	77.6	265.6	469.9	914.6
District of Columbia	.5	.1	.6	1.9	.1	2.0	----------	2.6	4.5	4.9	9.4	16.1	28.1
Total	6,649.3	575.9	7,225.2	1,376.6	1,646.8	3,023.4	2,301.3	12,549.9	4,801.3	10,926.8	15,728.1	12,519.8	[2] 40,797.8

[1] Location studies and public hearings have been undertaken on many portions of the mileages shown in this column.
[2] The system is limited to 41,000 miles by law. The small balance is held in reserve for adjustments as final locations are selected and projects built.

Table 12.—Status of Interstate System improvement as of June 30, 1962, financed with Federal-aid funds,[1] including projects completed during the fiscal year

State or Territory	Programed,[2] plans not approved			Plans approved, not under construction			Under construction			Completed during fiscal year		
	Total cost	Federal funds	Miles	Total cost	Federal funds	Miles	Total cost	Federal funds	Miles	Total cost	Federal funds	Miles
Alabama	$83,352,051	$52,657,396	112.9	$13,737,900	$12,364,110	43.5	$102,909,659	$82,735,332	147.6	$29,302,604	$26,178,894	73.8
Alaska												
Arizona	40,768,000	38,635,234	91.5	8,350,109	7,901,919	25.5	69,404,214	64,420,237	114.0	12,004,130	11,198,771	32.3
Arkansas	32,669,153	29,402,246	66.3	9,703,390	8,732,655	20.2	85,105,846	75,594,703	131.3	12,823,044	11,455,232	10.1
California	73,617,381	52,333,281	49.9	72,590,021	65,494,583	36.9	851,395,082	589,263,883	166.2	169,979,912	149,039,835	105.3
Colorado	17,706,430	16,167,857	68.3	5,850,908	5,338,481	24.4	31,105,819	25,217,530	47.3	18,371,413	16,532,358	69.7
Connecticut	239,000	215,100		138,091	121,430		111,366,828	97,587,206	17.6	30,041,906	26,846,202	20.6
Delaware	6,715,097	6,165,434	3.1	6,373,001	5,702,643	1.6	37,172,008	31,544,910	2.0	1,572,464	1,403,338	.3
Florida	15,696,745	14,127,151	16.2	15,129,994	13,616,989	49.5	63,634,508	57,253,425	62.5	51,754,925	46,508,037	84.6
Georgia	76,292,907	68,663,616	103.2	26,392,701	23,753,431	30.4	172,458,917	154,954,951	181.6	16,124,018	14,368,951	35.4
Hawaii	4,520,000	4,068,000	1.0				7,543,235	6,788,911		191,615	172,170	
Idaho	24,916,400	23,042,840	56.1	7,047,496	6,506,804	19.7	31,783,959	29,416,726	139.4	14,200,596	13,215,737	67.2
Illinois	28,793,653	25,985,543	54.7	43,557,775	38,745,781	37.2	333,959,001	294,199,077	149.1	103,191,427	90,203,696	58.3
Indiana	28,315,740	25,484,166	24.4	8,698,724	7,828,851	8.1	118,833,474	106,959,241	108.2	55,212,187	49,508,263	64.0
Iowa	9,250,388	8,322,646	15.9	11,006,278	10,029,111	21.1	40,504,514	36,508,696	79.0	19,475,596	17,525,733	28.2
Kansas	13,426,603	12,083,943	41.8	4,954,654	4,439,719	21.5	27,729,993	24,903,410	30.4	24,627,902	22,045,601	79.4
Kentucky	18,722,223	16,910,001	26.4	23,719,698	20,686,556	27.9	106,050,285	94,386,326	78.8	49,663,624	44,579,691	90.9
Louisiana	37,167,100	33,450,390	15.8	9,023,870	8,118,000	6.5	212,481,851	185,633,173	135.5	21,429,806	19,220,974	17.6
Maine	3,181,600	2,880,640	2.8	10,679,950	9,611,955	25.2	16,193,910	14,563,631	22.6	8,253,062	7,336,354	18.8
Maryland	24,664,030	21,791,007	22.3	11,103,045	9,466,401	6.8	91,127,637	78,539,188	33.6	34,886,435	29,763,737	12.5
Massachusetts	24,987,346	22,488,612	8.9	57,478,164	51,182,131	30.7	107,441,101	94,779,618	35.1	48,025,445	40,649,053	21.1
Michigan	5,424,322	4,881,891	14.4	44,877,255	40,345,344	58.8	199,521,998	179,430,339	208.1	95,139,793	84,642,297	79.9
Minnesota	97,262,850	43,675,168	32.2	16,942,719	15,249,744	33.4	161,177,109	143,454,773	128.2	32,230,114	29,237,129	48.8
Mississippi	35,228,200	31,747,220	108.0	9,215,257	8,321,837	36.2	69,796,673	62,481,184	197.3	25,293,215	22,184,914	66.1
Missouri	19,956,590	17,974,819	14.9	16,789,063	15,076,011	30.4	147,017,934	132,225,672	147.6	40,982,223	37,083,408	49.4
Montana	20,831,582	19,040,020	70.6	6,107,238	5,721,102	13.0	72,888,274	66,653,949	135.7	15,931,934	14,600,198	66.8
Nebraska	25,038,200	22,551,040	114.1	10,735,400	9,661,860	55.7	60,875,651	54,874,921	78.6	15,471,057	13,908,888	26.3
Nevada	8,790,000	8,350,500	28.1	8,206,756	7,803,882	17.9	47,003,358	44,652,920	58.9	7,962,470	7,563,625	28.4
New Hampshire	99,308	89,376		3,978,882	3,580,990	3.9	28,240,944	24,880,768	20.1	8,017,364	6,635,412	6.6
New Jersey	25,204,546	21,787,061	9.1	54,849,680	48,775,330	22.7	201,487,951	176,766,628	24.8	20,068,717	17,760,172	5.0
New Mexico	20,933,780	19,477,524	44.8	10,374,627	9,475,763	24.5	31,912,435	29,366,032	55.3	16,498,036	15,238,649	62.3
New York	636,040	480,240	28.9	139,352,081	119,423,302	32.1	426,412,614	367,348,155	80.0	105,287,536	94,268,315	63.7

North Carolina	21,458,985	19,311,291	68.2	127,277	114,546		53,259,892	47,457,525	144.7	15,819,221	14,139,898	59.3
North Dakota	222,800	200,520		3,581,735	3,252,670	21.1	13,183,568	12,097,468	33.0	14,057,782	12,818,010	73.7
Ohio	45,389,840	40,938,356	48.1	23,918,407	21,547,078	18.0	228,582,659	199,368,357	97.0	111,149,088	97,777,610	42.0
Oklahoma	3,049,900	2,694,910	36.3	6,553,450	5,875,866	16.8	41,300,821	37,073,205	67.4	17,543,151	15,651,151	81.3
Oregon	13,680,555	12,362,900	24.4	9,756,145	8,967,600	36.0	114,852,563	101,774,359	152.9	22,767,872	19,326,441	69.9
Pennsylvania	67,058,720	59,985,648	84.4	21,092,663	18,983,396	17.1	226,133,195	201,782,632	143.8	45,630,998	40,959,504	22.7
Rhode Island	2,078,415	1,870,573		4,028,720	3,574,998	1.7	46,095,920	40,803,460	5.4	1,280,610	1,149,817	
South Carolina	6,166,624	5,549,962	49.4	5,036,079	4,636,782	5.3	40,911,573	36,322,119	107.1	25,264,572	22,598,638	79.2
South Dakota	11,255,000	10,248,800	49.5	187,700	170,916		35,598,745	32,420,779	85.0	26,146,388	23,775,415	107.3
Tennessee	36,491,888	32,842,700	43.9	24,724,105	22,251,690	37.2	204,267,744	180,987,722	205.9	67,130,706	60,137,416	124.0
Texas	62,742,000	55,771,680	153.1	14,653,800	13,158,700	39.2	188,219,473	163,288,990	225.8	150,124,151	134,931,160	163.9
Utah	32,266,724	30,568,518	57.2	10,640,997	10,086,580	14.1	43,679,833	41,234,089	24.4	11,912,692	11,233,863	40.9
Vermont	7,709,000	6,938,100	11.7				36,357,974	32,591,905	37.0	23,784,029	21,399,833	18.4
Virginia	40,580,927	36,628,172	49.5	15,517,888	13,955,960	29.3	297,578,497	267,251,739	277.6	27,288,109	24,593,403	46.8
Washington	18,080,160	7,513,764	15.9	14,640,278	10,579,626	25.6	106,858,348	96,373,019	54.0	15,181,830	12,689,751	23.0
West Virginia	41,379,085	37,241,178	53.0	5,894,222	5,304,799	5.7	57,296,606	50,496,041	44.4	25,053,695	21,933,215	31.0
Wisconsin	22,316,340	20,232,954	85.2	9,432,862	8,299,690	18.3	44,820,534	39,000,651	60.7	42,635,123	38,497,979	143.5
Wyoming	3,777,571	3,509,098	19.4	3,655,862	3,394,321	14.3	40,746,977	37,891,849	191.8	25,616,281	23,764,984	147.0
District of Columbia	3,551,050	3,197,710	2.0	16,109,433	14,097,857	.8	63,817,806	56,968,808	4.0	14,065,285	12,121,048	3.2
Puerto Rico												
Total	1,263,662,849	1,052,536,796	2,097.8	856,516,350	761,329,790	1,065.8	5,948,099,510	5,102,570,232	4,778.3	1,786,466,063	1,590,374,770	2,670.5

[1] Includes projects financed from Federal-aid primary, secondary, urban, and Interstate funds. [2] Initial commitment of funds.

Table 13.—Status of improvement of the Federal-aid primary system in rural areas as of June 30, 1962, financed with Federal-aid funds,[1] including projects completed during the fiscal year

State or Territory	Programed,[2] plans not approved			Plans approved, not under construction			Under construction			Completed during fiscal year		
	Total cost	Federal funds	Miles	Total cost	Federal funds	Miles	Total cost	Federal funds	Miles	Total cost	Federal funds	Miles
Alabama	$44,864,268	$37,882,303	109.4	$17,912,492	$14,498,126	73.9	$77,504,781	$61,996,907	192.8	$46,516,204	$31,084,163	191.1
Alaska	27,011,246	25,555,562	295.2	5,720,586	5,303,889	24.9	32,326,620	27,933,166	116.6	4,402,993	3,229,663	83.4
Arizona	42,498,000	39,994,997	114.2	9,325,295	8,359,531	38.3	62,753,705	56,475,077	170.7	12,379,117	10,810,083	58.8
Arkansas	36,779,296	31,616,676	112.0	10,839,420	6,774,872	65.2	91,043,927	69,430,360	384.0	8,308,807	4,615,432	78.1
California	74,316,954	55,509,051	53.0	49,473,931	41,149,209	29.0	216,434,807	143,666,790	139.7	65,906,900	49,550,625	91.7
Colorado	19,581,142	16,960,398	92.2	6,231,457	5,464,674	34.4	29,782,837	22,861,489	141.9	26,054,893	19,550,138	195.8
Connecticut	239,000	215,100		247,937	140,037	.9	37,756,714	30,803,009	17.4	30,268,033	23,502,439	28.2
Delaware	11,119,097	8,366,584	19.8	2,938,001	2,611,143	.9	26,491,451	21,552,740	2.3	2,062,397	1,629,649	3.0
Florida	15,540,399	10,661,851	58.9	13,230,677	11,023,807	71.0	50,682,177	36,582,314	228.1	32,275,058	26,526,602	130.8
Georgia	62,743,089	54,173,475	205.2	25,287,677	18,733,316	88.3	138,015,970	108,255,612	315.6	28,863,815	20,910,510	115.3
Hawaii	4,085,000	2,665,300	4.9				6,070,795	3,377,006	10.5	3,437,516	1,785,465	5.0
Idaho	24,310,251	21,805,663	86.7	10,835,036	8,806,967	48.5	36,883,171	32,064,865	231.5	18,114,307	14,856,512	121.2
Illinois	22,920,102	19,162,559	61.7	36,952,965	28,743,631	94.8	168,682,627	137,166,550	256.8	91,584,058	68,228,634	210.4
Indiana	29,042,651	22,753,982	81.8	10,670,137	7,216,085	101.1	127,223,737	99,492,169	227.0	63,205,582	46,143,497	260.5
Iowa	16,443,308	11,964,080	90.3	10,333,323	8,352,985	84.8	52,585,671	38,920,678	399.4	29,207,260	19,554,710	286.7
Kansas	14,009,687	11,418,985	87.4	12,714,239	7,829,239	147.6	23,634,950	15,118,335	282.9	32,329,318	21,956,637	351.3
Kentucky	14,683,997	11,615,592	32.5	13,201,832	10,805,125	28.5	101,521,112	79,656,890	171.3	45,719,008	38,190,562	121.3
Louisiana	27,438,376	23,152,894	32.5	7,365,840	5,215,510	50.1	146,152,844	121,254,407	217.1	27,957,061	18,533,921	115.4
Maine	10,434,600	6,509,780	30.6	10,886,650	9,711,805	25.4	23,940,000	17,406,467	62.7	9,121,979	6,865,001	30.5
Maryland	24,380,330	20,033,777	29.7	2,612,229	1,568,557	7.2	20,804,695	13,568,693	32.2	7,579,189	4,594,577	21.5
Massachusetts	3,788,195	2,951,498	10.5	33,400,715	24,400,016	35.8	59,085,106	47,310,314	29.3	22,314,193	16,631,957	19.7
Michigan	10,228,422	7,232,781	51.2	32,878,183	27,121,871	111.3	189,916,662	154,714,740	399.1	87,354,586	68,040,400	293.0
Minnesota	25,046,882	17,421,385	24.3	21,782,439	16,547,179	121.2	68,567,414	52,394,517	422.7	43,421,159	26,157,921	476.5
Mississippi	40,289,267	33,914,548	162.3	11,118,661	8,719,192	80.5	78,224,416	62,389,744	379.2	26,861,012	19,863,781	190.8
Missouri	18,859,411	16,300,521	17.7	19,512,380	13,678,718	84.5	132,496,758	104,081,752	257.3	33,769,363	25,547,644	99.5
Montana	24,669,832	21,526,657	188.4	4,341,675	3,497,564	33.3	82,201,360	69,084,574	367.4	24,765,389	19,601,477	185.9
Nebraska	26,652,640	23,113,172	127.4	12,315,054	10,139,396	83.1	50,343,537	39,430,099	272.6	29,632,498	19,839,445	254.0
Nevada	10,925,744	10,265,922	62.2	9,461,831	8,932,570	26.5	30,628,310	28,667,450	107.1	17,531,582	15,722,250	127.1
New Hampshire	893,308	461,976	4.4	3,978,882	3,580,990	3.9	29,790,927	24,471,704	30.7	9,744,619	6,965,921	20.8
New Jersey	22,793,740	19,168,246	10.3	26,715,374	23,164,717	16.5	61,964,495	49,214,112	41.6	7,794,630	5,812,615	8.6
New Mexico	15,667,543	13,969,362	54.4	6,725,160	5,981,406	30.1	19,911,910	16,320,077	92.0	21,765,134	17,243,336	114.4
New York	675,200	553,740	1.3	14,465,564	9,110,110	53.9	149,528,914	94,614,314	245.7	87,425,174	60,205,668	171.2

North Carolina	28,891,045	22,654,105	88.2	1,256,507	679,161	9.3	84,008,012	61,961,716	315.1	28,760,656	19,969,634	203.7
North Dakota	384,800	286,320	1.2	5,383,195	4,153,400	77.0	22,891,279	16,587,964	289.3	23,828,979	17,539,089	257.7
Ohio	47,326,438	41,922,307	48.9	30,292,903	24,337,260	40.3	141,173,280	106,607,882	161.1	67,385,409	53,328,761	68.2
Oklahoma	8,058,800	5,206,410	89.6	17,432,400	10,807,224	126.2	40,725,066	28,414,479	184.0	39,195,878	26,327,532	285.2
Oregon	11,267,555	10,184,900	24.4	12,008,753	10,160,980	42.8	67,019,676	54,439,169	203.7	21,446,830	16,552,591	100.6
Pennsylvania	64,153,818	45,303,024	99.9	25,348,473	18,015,141	36.8	209,849,301	161,592,720	241.2	41,851,783	31,148,461	39.1
Rhode Island	310,332	232,226		531,070	434,413	.6	9,195,184	4,876,570	19.5	2,152,262	1,336,995	
South Carolina	11,682,275	7,821,776	91.1	5,528,267	4,013,673	21.0	50,493,673	37,153,022	277.9	29,535,247	24,738,640	122.9
South Dakota	20,940,000	15,606,542	290.2	2,617,418	1,490,477	59.2	37,696,621	32,109,112	185.5	26,852,842	22,456,903	276.2
Tennessee	27,531,134	21,963,070	63.7	14,459,032	12,290,887	39.3	132,166,852	104,923,233	281.4	44,123,655	37,157,731	188.3
Texas	29,909,000	26,189,080	113.9	6,488,200	5,236,240	53.7	111,802,878	80,039,630	608.1	89,396,119	64,509,925	693.5
Utah	28,271.146	26,329.013	63.2	8,950,601	7,359 277	54.2	27,423,549	24,387.074	91.2	13,994,599	12,441,317	63.8
Vermont	7,709,000	6,938,100	11.7				34,182,302	27,704,062	46.9	27,294,785	22,197,681	36.2
Virginia	40,576,467	36,595,142	49.9	19,044,940	15,421,257	47.3	264,920,937	225,016,538	375.5	39,168,258	31,086,209	100.4
Washington	8,856,513	7,698,977	19.7	17,634,119	8,753,411	40.6	54,992,771	40,727,037	128.0	16,108,747	10,170,574	82.9
West Virginia	29.648,041	23,705,292	62.0	3,218,900	2,891,010	2.8	62,716,125	50,376,272	66.1	23.014,211	18,627,018	66.4
Wisconsin	21,472,985	19,472,685	85.2	8,699,074	5,631,280	100.2	46,377,355	33,661,904	213.1	44,823,241	33,401,927	283.6
Wyoming	4,189,704	3,775,770	27.8	4,826.071	3,927,245	22.2	48,656,940	42,702,709	244.1	35,191,838	30,016,909	218.1
District of Columbia												
Puerto Rico	5,290,000	2,645,000	9.6	2,091.709	1,036,487	5.3	6,222,499	2,959,494	13.5	3,749,448	1,828,508	6.7
Total	1,119,400,030	923,428,156	3,552.6	639,287,274	493,821,060	2,474.2	3,875,466,700	3,016,517,538	10,190.4	1,615,547,621	1,208,587,640	7,555.0

[1] Includes projects on rural portions of the Federal-aid primary highway system financed from Federal-aid primary, secondary, and Interstate funds.

[2] Initial commitment of funds.

Table 14.—Status of improvements on secondary roads in rural areas as of June 30, 1962, financed with Federal-aid funds,[1] including projects completed during the fiscal year

State or Territory	Programed,[2] plans not approved			Plans approved, not under construction			Under construction			Completed during fiscal year		
	Total cost	Federal funds	Miles	Total cost	Federal funds	Miles	Total cost	Federal funds	Miles	Total cost	Federal funds	Miles
Alabama				$311,500	$155,750	10.1	$20,210,786	$9,830,836	645.9	$14,446,371	$6,846,802	471.5
Alaska	$13,140,200	$12,404,448	130.6	3,478,402	3,181,882	11.7	22,028,990	18,934,336	84.3	3,224,238	2,966,163	79.7
Arizona	30,000	27,000		175,000	130,646	2.0	11,951,552	8,736,541	165.1	2,782,662	1,956,172	30.4
Arkansas	72,000	36,000		874,330	437,165	32.6	25,358,475	12,399,422	534.1	8,750,511	4,351,535	225.3
California							20,048,050	11,136,499	186.2	14,869,472	8,627,527	128.3
Colorado							4,393,545	2,823,025	99.5	10,943,607	5,837,985	223.8
Connecticut							2,188,686	1,080,891	8.7	5,025,210	2,520,143	20.7
Delaware							3,231,700	1,613,000	26.2	685,708	345,414	
Florida	1,320,000	660,000	43.5				15,221,408	7,610,704	236.8	6,652,177	3,012,409	101.8
Georgia	344,916	272,708	6.3	408,200	249,700	8.0	36,380,084	17,864,489	640.8	13,783,409	6,835,128	314.1
Hawaii	4,190,200	2,095,100	14.5				720,001	356,265	.1	438,587	263,133	2.1
Idaho	44,000	39,600		652,339	410,247	9.1	9,826,092	6,399,777	184.8	3,444,062	2,209,076	80.2
Illinois	959,350	479,675	11.4	81,000	40,500	.4	37,428,243	18,667,365	556.8	15,637,730	7,633,002	406.1
Indiana	13,302,970	6,827,485	118.7	2,755,132	1,359,222	59.7	11,349,834	5,693,707	47.9	13,694,981	6,877,715	128.4
Iowa				162,006	85,805	3.4	18,264,205	9,181,303	738.0	12,435,470	6,246,535	575.0
Kansas	665,610	332,805	36.3	72,000	36,000	1.1	14,452,547	7,244,073	823.8	13,934,113	6,964,580	771.4
Kentucky				317,401	167,201	1.0	25,463,576	12,333,694	237.4	14,023,103	7,373,252	83.8
Louisiana							21,208,195	10,317,400	240.3	7,136,165	3,564,846	106.4
Maine	331,800	165,900	3.2				8,705,344	3,970,416	77.9	4,668,436	2,328,928	37.0
Maryland				799,100	399,800	17.8	4,383,532	2,217,015	107.2	3,259,196	1,731,202	98.7
Massachusetts	220,000	110,000	1.9				5,214,589	2,580,884	19.5	2,858,688	1,680,001	8.2
Michigan	48,000	24,000	4.0	267,700	137,050	7.5	28,934,138	14,709,249	873.1	16,091,919	8,069,322	555.7
Minnesota	40,000	20,000		50,772	45,695		13,055,136	6,215,983	719.8	17,094,907	8,714,574	1,001.9
Mississippi	4,250	2,125		112,907	62,016	6.2	20,077,407	9,210,821	665.3	8,801,706	3,972,473	296.8
Missouri	1,373,800	686,900	84.6				21,121,518	10,623,111	1,064.1	15,122,638	7,627,003	886.8
Montana	12,200	10,076		1,839,700	1,276,376	57.4	18,681,187	10,612,303	308.0	7,203,421	4,305,739	119.2
Nebraska	235,430	126,915	10.3	305,242	152,621	10.0	28,101,709	14,148,315	1,006.1	14,304.441	7,300,720	487.6
Nevada				512,000	460,441	12.7	6,162,012	5,546,001	106.0	1,468,740	1,268,886	19.8
New Hampshire							6,504,980	3,248,277	31.4	2,305,603	1,122,284	13.8
New Jersey	974,000	487,000	8.3				4,449,639	2,223,324	29.3	927,031	446,888	7.5
New Mexico				16,000	14,400		6,913,058	4,538,387	99.1	6,777,587	4,830,018	107.4
New York				1,374,462	669,646	13.0	32,723,556	14,968,731	147.5	10,900,342	4,943,856	80.7

North Carolina	1,181,000	590,500		358,000	214,000	5.0	25,596,120	12,047,605	248.3	13,178,642	5,996,188	336.7
North Dakota	286,000	143,000	66.7	32,000	28,800		10,709,930	5,343,901	650.4	9,235,987	4,628,638	786.8
Ohio				1,851,486	931,823	12.1	43,461,449	23,173,925	215.3	18,398,572	9,770,440	134.5
Oklahoma	471,778	203,789	37.5	1,168,078	589,848	51.9	19,940,239	10,174,409	564.7	8,775,199	4,402,866	329.2
Oregon	354,000	212,000	4.0	188,000	112,600	11.8	10,511,644	6,453,220	118.9	6,740,664	4,163,471	129.6
Pennsylvania	2,110,000	1,055,000	10.8	3,407,800	1,703,900	5.6	41,075,307	20,523,529	175.3	12,118,673	6,051,398	49.9
Rhode Island				550,000	275,000	1.9	1,108,060	554,030	4.3	1,147,650	562,420	3.8
South Carolina	790,400	467,200	42.9	461,400	234,620	18.8	15,564,331	7,827,575	874.5	8,843,624	4,194,045	456.2
South Dakota	147,600	82,025	11.6				8,203,408	4,640,870	442.9	5,101,202	2,791,479	351.5
Tennessee	1,392,000	696,000	35.2	434,444	217,222	13.5	20,415,925	10,015,097	555.4	12,597,273	6,302,316	542.3
Texas	121,000	60,500	2.6				34,208,095	17,319,700	700.2	32,674,936	16,401,100	910.4
Utah				18,000	16,200		8,089,280	6,052,647	110.1	4,215,564	2,849,114	62.1
Vermont							4,197,428	2,098,714	26.9	3,057,449	1,512,502	28.2
Virginia				550,895	337,486	11.9	18,629,571	9,734,218	214.9	13,667,334	7,036,203	201.0
Washington	370,900	210,400	28.0				11,342,178	6,147,518	175.9	13,584,314	6,504,119	282.9
West Virginia	1,321,320	660,660	1.9	2,525,793	1,399,865	9.2	20,696,126	10,297,633	57.6	5,172,841	2,553,352	72.8
Wisconsin				8,000	4,000		14,275,900	7,200,950	352.2	13,097,540	6,501,645	338.9
Wyoming							9,846,026	6,216,830	156.4	4,474,627	2,951,419	90.8
District of Columbia												
Puerto Rico							10,352,673	4,935,598	44.0	4,642,917	2,185,865	24.2
Total	45,854,724	29,188,811	714.8	26,119,089	15,537,527	405.4	832,977,464	437,794,113	16,399.2	464,417,239	240,131,891	12,601.9

[1] Includes projects on secondary roads in rural areas financed from Federal-aid secondary funds. [2] Initial commitment of funds.

Table 15.—Status of improvements in urban areas as of June 30, 1962, financed with Federal-aid funds,[1] including projects completed during the fiscal year

State or Territory	Programed,[2] plans not approved			Plans approved, not under construction			Under construction			Completed during fiscal year		
	Total cost	Federal funds	Miles	Total cost	Federal funds	Miles	Total cost	Federal funds	Miles	Total cost	Federal funds	Miles
Alabama	$40,694,097	$15,988,850	9.9	$2,818,526	$1,387,075	4.6	$61,558,785	$38,508,748	36.8	$15,942,510	$11,135,880	34.9
Alaska	1,416,856	1,340,204	2.8	119,557	105,363	----	1,268,479	1,120,186	----	92,525	85,707	.3
Arizona	677,000	565,996	1.9	1,906,032	1,748,316	8.0	20,262,594	18,332,376	18.2	4,749,044	3,842,670	6.0
Arkansas	2,985,960	1,652,155	18.2	6,642,430	5,844,898	10.1	29,461,750	24,675,446	25.7	21,567,386	15,465,111	21.8
California	11,102,607	3,601,296	1.4	42,213,873	35,541,754	19.1	802,924,135	537,949,515	129.2	150,922,131	125,041,410	62.8
Colorado	2,586,600	1,761,664	5.8	911,519	608,778	4.5	23,084,391	15,321,274	12.1	8,756,989	5,792,061	8.1
Connecticut	670,000	335,000	.1	269,292	169,404	----	108,309,438	83,604,289	10.6	20,120,070	13,028,564	11.8
Delaware	643,000	334,000	1.4	4,353,400	3,541,500	4.6	12,409,549	10,854,016	.4	8,032	4,016	----
Florida	12,752,236	9,850,745	16.8	5,460,817	4,373,932	7.6	40,994,765	34,906,261	20.1	27,186,502	23,720,925	10.1
Georgia	29,985,918	22,883,991	37.4	16,741,599	12,919,216	14.4	105,208,876	82,434,123	74.3	4,595,016	1,933,857	11.2
Hawaii	9,120,848	5,720,424	4.0	----	----	----	8,456,841	6,869,208	.2	2,135,843	933,720	.6
Idaho	4,910,262	4,068,309	10.1	412,679	347,332	.6	5,216,766	4,037,626	4.8	4,136,666	3,645,400	13.2
Illinois	18,159,700	13,044,267	14.9	36,776,379	27,545,241	17.6	264,194,070	208,455,710	64.8	75,274,932	56,336,294	39.4
Indiana	10,174,939	8,225,349	4.9	4,534,245	3,868,459	2.3	64,029,288	44,909,476	36.0	30,967,571	22,937,389	30.3
Iowa	3,339,778	1,827,315	11.2	3,744,347	3,229,094	3.0	16,166,068	12,128,857	25.7	10,746,194	8,216,976	14.7
Kansas	4,420,800	3,192,600	4.8	2,143,240	1,629,167	2.8	23,090,816	19,401,465	5.1	12,162,645	10,079,005	26.6
Kentucky	11,020,572	8,792,115	4.6	13,754,001	11,573,526	3.8	43,694,506	34,521,022	18.2	16,385,967	13,330,087	12.8
Louisiana	13,063,200	11,756,880	2.8	6,797,740	5,497,930	5.6	107,033,617	85,230,196	38.0	14,522,267	11,207,791	10.9
Maine	1,811,546	1,168,158	4.1	1,019,462	544,841	3.2	5,234,718	4,197,576	2.3	5,652,697	3,722,228	5.8
Maryland	11,920,200	7,975,655	16.9	19,386,586	13,167,449	13.0	91,429,880	75,568,321	46.5	44,060,958	33,609,128	33.7
Massachusetts	22,582,374	20,228,726	7.7	48,447,858	38,502,084	26.9	125,755,140	85,575,875	51.2	39,853,061	31,056,571	17.5
Michigan	9,358,600	4,798,860	27.1	24,742,549	18,031,184	18.5	96,170,022	68,060,180	23.7	73,235,453	49,240,455	20.0
Minnesota	76,935,864	26,404,613	8.1	4,663,794	3,431,617	6.7	135,798,886	113,638,043	50.1	36,787,253	28,534,742	45.8
Mississippi	2,990,525	2,057,447	3.3	2,366,367	1,747,660	10.5	17,954,533	13,727,751	20.0	13,574,630	9,879,678	31.7
Missouri	7,070,722	4,690,673	7.2	14,846,371	10,157,359	13.4	80,320,194	60,693,573	20.4	26,309,741	21,491,871	18.5
Montana	1,863,885	1,069,921	4.0	3,899,074	3,502,336	4.1	15,006,683	12,267,739	16.9	3,069,946	1,894,458	13.0
Nebraska	778,920	640,548	.2	1,908,480	1,507,005	1.9	30,790,148	26,315,227	6.3	4,462,297	3,713,855	5.2
Nevada	64,000	57,555	.4	----	----	----	24,255,181	23,008,762	.1	567,547	523,606	1.3
New Hampshire	1,435,000	741,900	2.9	----	----	----	3,734,932	3,053,295	1.4	2,324,459	1,666,606	2.7
New Jersey	8,670,866	5,748,795	11.3	38,101,566	30,565,543	12.6	201,393,026	158,475,884	41.6	36,066,531	23,745,205	14.2
New Mexico	9,368,700	8,370,799	7.2	4,811,415	4,248,669	4.6	23,483,328	20,664,478	8.2	7,121,737	5,226,876	10.6
New York	167,840	30,000	28.5	202,012,441	146,124,844	53.2	530,591,322	391,309,267	121.8	121,363,148	85,244,582	56.3

North Carolina	6,851,090	3,952,331	12.5	1,232,960	616,480	3.0	14,536,593	8,241,997	21.3	6,034,611	3,755,867	15.7
North Dakota	86,000	53,400	----------	635,950	552,675	.5	2,171,078	1,508,167	2.4	1,589,908	981,619	7.7
Ohio	2,642,640	1,325,500	1.8	17,165,255	10,823,339	13.1	189,267,103	148,961,874	73.5	87,964,741	69,374,218	19.2
Oklahoma	8,004,500	3,868,412	22.6	5,773,118	3,398,888	16.7	24,136,179	20,491,449	11.4	5,100,415	2,879,599	12.0
Oregon	5,637,500	2,607,000	1.5	8,762,179	1,938,946	4.8	73,281,669	62,972,238	15.5	12,499,940	9,822,107	16.5
Pennsylvania	59,946,700	43,090,770	66.9	18,210,249	11,932,805	9.8	152,187,376	107,903,981	57.3	32,673,976	23,513,736	23.3
Rhode Island	4,696,765	3,102,688	.7	3,553,650	3,168,585	1.0	57,627,253	46,310,600	9.4	3,524,666	1,976,870	9.5
South Carolina	3,444,362	2,408,044	12.0	4,641,689	3,346,249	14.2	20,268,123	14,483,065	32.6	3,573,759	1,860,807	5.7
South Dakota	1,225,000	677,670	5.4	101,683	80,804	----------	5,193,779	4,345,395	5.7	5,498,726	4,702,221	6.4
Tennessee	19,759,205	16,583,855	15.0	12,457,245	11,056,889	7.9	130,604,971	104,561,617	36.6	32,184,984	27,541,674	34.0
Texas	36,668,100	31,416,600	55.2	15,885,700	12,565,460	21.3	168,756,166	131,896,460	136.5	123,969,555	104,479,585	86.8
Utah	6,951,449	6,521,327	7.0	9,062,563	8,365,633	11.5	24,950,245	23,435,577	1.8	3,082,971	2,606,461	2.2
Vermont	----------	----------	----------	1,226,922	600,658	2.9	9,902,103	8,752,908	11.5	2,593,490	2,244,529	----------
Virginia	3,917,000	2,003,700	6.7	708,341	637,506	.2	79,535,610	65,730,208	20.6	3,129,327	1,802,170	6.9
Washington	12,731,561	1,619,735	----------	7,186,026	5,604,011	8.9	96,357,049	77,947,269	25.0	11,000,049	8,716,546	10.8
West Virginia	25,271,363	20,306,045	12.4	2,821,271	2,486,763	2.8	23,186,961	14,412,205	5.8	8,157,659	6,206,949	4.0
Wisconsin	859,855	773,869	----------	7,031,604	5,731,960	8.2	49,043,079	30,544,260	13.3	22,273,851	17,222,026	22.6
Wyoming	23,254	19,458	----------	1,662,645	1,341,618	2.7	2,462,317	2,224,644	2.4	1,575,700	1,263,077	5.8
District of Columbia	5,454,500	4,141,435	3.6	19,385,805	15,930,914	1.8	90,589,462	69,479,086	12.2	22,437,820	17,816,798	5.3
Puerto Rico	3,000,000	1,500,000	.7	9,069,493	4,298,042	6.2	8,789,880	4,043,380	6.7	4,031,981	1,990,325	2.8
Total	539,914,259	344,896,649	505.9	663,379,987	495,939,801	414.8	4,342,039,723	3,268,062,145	1,432.2	1,227,619,877	937,043,908	889.0

[1] Includes projects in urban areas financed from Federal-aid primary, secondary, urban, and Interstate funds. [2] Initial commitment of funds.

Table 16.—Mileage of designated Federal-aid highway systems, by State, as of December 31, 1961

State or Territory	National System of Interstate and Defense Highways (Included with primary mileage)			Federal-aid primary highway system (Includes Interstate mileage)			Federal-aid secondary highway system			Grand total		
	Rural	Urban	Total	Rural	Urban	Total	Rural	Urban	Total	Rural	Urban	Total
Alabama	781	94	875	5,748	693	6,441	22,582	453	23,035	28,330	1,146	29,476
Alaska				[1] 3,284	22	3,306	3,215	19	3,234	[1] 6,499	41	6,540
Arizona	1,122	39	1,161	2,667	103	2,770	3,773	312	4,085	6,440	415	6,855
Arkansas	477	41	518	3,728	264	3,992	14,351	222	14,573	18,079	486	18,565
California	1,624	553	2,177	7,980	1,502	9,482	11,156	928	12,084	19,136	2,430	21,566
Colorado	862	86	948	4,170	414	4,584	3,919	56	3,975	8,089	470	8,559
Connecticut	161	132	293	873	396	1,269	1,004	196	1,200	1,877	592	2,469
Delaware	36	4	40	608	49	657	1,415	19	1,434	2,023	68	2,091
Florida	1,012	108	1,120	4,765	613	5,378	13,556	494	14,050	18,321	1,107	19,428
Georgia	966	138	1,104	8,085	804	8,889	19,337	421	19,758	27,422	1,225	28,647
Hawaii	38	10	48	486	38	524	649	10	659	1,135	48	1,183
Idaho	593	19	612	3,152	89	3,241	5,346	49	5,395	8,498	138	8,636
Illinois	1,356	230	1,586	9,571	1,254	10,825	13,717	289	14,006	23,288	1,543	24,831
Indiana	982	139	1,121	5,214	790	6,004	16,790	264	17,054	22,004	1,054	23,058
Iowa	656	53	709	9,650	554	10,204	32,905	230	33,135	42,555	784	43,339
Kansas	687	114	801	7,323	461	7,784	23,593	179	23,772	30,916	640	31,556
Kentucky	637	59	696	4,214	331	4,545	15,068	185	15,253	19,282	516	19,798
Louisiana	590	93	683	2,933	398	3,331	8,677	185	8,862	11,610	583	12,193
Maine	292	20	312	1,784	143	1,927	2,242	61	2,303	4,026	204	4,230
Maryland	211	143	354	1,780	576	2,356	6,665	533	7,198	8,445	1,109	9,554
Massachusetts	281	181	462	1,518	822	2,340	1,674	575	2,249	3,192	1,397	4,589
Michigan	918	161	1,079	6,334	766	7,100	25,324	504	25,828	31,658	1,270	32,928
Minnesota	772	126	898	8,050	771	8,821	30,017	364	30,381	38,067	1,135	39,202
Mississippi	615	63	678	5,556	273	5,829	16,195	227	16,422	21,751	500	22,251
Missouri	980	125	1,105	8,372	576	8,948	23,026	126	23,152	31,398	702	32,100
Montana	1,164	16	1,180	6,354	103	6,457	5,393	23	5,416	11,747	126	11,873
Nebraska	482	9	491	5,711	159	5,870	17,597	43	17,640	23,308	202	23,510
Nevada	524	10	534	2,156	43	2,199	2,873	27	2,900	5,029	70	5,099
New Hampshire	196	18	214	1,116	118	1,234	1,620	54	1,674	2,736	172	2,908
New Jersey	208	168	376	1,310	809	2,119	1,602	567	2,169	2,912	1,376	4,288
New Mexico	972	33	1,005	3,814	216	4,030	5,498	84	5,582	9,312	300	9,612
New York	804	423	1,227	8,367	2,251	10,618	17,722	1,592	19,314	26,089	3,843	29,932

North Carolina	715	54	769	6,039	525	6,564	26,226	474	26,700	32,265	999	33,264
North Dakota	556	12	568	4,395	55	4,450	12,881	18	12,899	17,276	73	17,349
Ohio	1,252	234	1,486	6,761	1,230	7,991	17,330	755	18,085	24,091	1,985	26,076
Oklahoma	694	102	796	7,811	486	8,297	12,763	360	13,123	20,574	846	21,420
Oregon	677	54	731	3,887	250	4,137	7,706	105	7,811	11,593	355	11,948
Pennsylvania	1,313	262	1,575	7,121	1,431	8,552	12,208	1,216	13,424	19,329	2,647	21,976
Rhode Island	32	39	71	265	213	478	324	157	481	589	370	959
South Carolina	662	17	679	5,072	384	5,456	17,378	199	17,577	22,450	583	23,033
South Dakota	670	9	679	5,981	89	6,070	12,485	22	12,507	18,466	111	18,577
Tennessee	926	122	1,048	6,252	525	6,777	10,975	58	11,033	17,227	583	17,810
Texas	2,504	520	3,024	15,416	1,971	17,387	32,335	679	33,014	47,751	2,650	50,401
Utah	890	45	935	2,306	90	2,396	3,742	65	3,807	6,048	155	6,203
Vermont	312	12	324	1,528	91	1,619	1,810	21	1,831	3,338	112	3,450
Virginia	952	101	1,053	5,080	530	5,610	18,344	220	18,564	23,424	750	24,174
Washington	596	130	726	3,684	332	4,016	10,811	353	11,164	14,495	685	15,180
West Virginia	486	37	523	2,556	223	2,779	10,638	101	10,739	13,194	324	13,518
Wisconsin	425	27	452	5,846	506	6,352	18,154	846	19,000	24,000	1,352	25,352
Wyoming	896	20	916	3,566	56	3,622	2,426	12	2,438	5,992	68	6,060
District of Columbia		28	28		167	167		121	121		288	288
Puerto Rico				407	143	550	1,033	52	1,085	1,440	195	1,635
Total	35,557	5,233	[2] 40,790	240,646	25,698	266,344	598,070	15,125	613,195	838,716	40,823	879,539

[1] Alaska includes 671 miles of ferry routes.
[2] 210 miles within the 41,000-mile limitation are not assigned to routes, and are held in reserve for adjustments of route lengths as final locations are selected and projects built.

Table 17.—Status of national forest highway projects as of June 30, 1962, and projects completed during the fiscal year [1]

State or Territory	Programed,[2] construction not yet authorized			Construction authorized, not started			Under construction			Completed during fiscal year		
	Total cost	Federal funds	Miles	Total cost	Federal funds	Miles	Total cost	Federal funds	Miles	Total cost	Federal funds	Miles
Alabama							$105,800	$105,800	3.6	$416,008	$416,008	6.5
Alaska	$522,000	$522,000	2.8	$4,329,000	$4,329,000	13.7	5,840,699	5,840,699	34.1	424,700	424,700	3.5
Arizona				2,174,900	2,174,900	28.9	2,656,006	2,656,006	68.3	1,442,945	1,442,945	30.7
Arkansas	140,000	140,000	6.2				1,009,380	504,690	22.0	1,516,850	758,425	23.2
California	4,409,000	4,409,000	36.2	3,724,000	3,724,000	19.2	4,338,807	4,338,807	23.2	4,598,856	4,592,189	55.5
Colorado	2,360,000	2,360,000	18.2	1,419,860	1,419,860	7.1	2,823,585	2,823,585	12.5	1,728,508	1,728,508	30.2
Florida				423,060	423,060	5.6				82,545	77,397	.3
Georgia	276,398	276,398	5.9	123,602	123,602	1.4						
Idaho	3,886,000	3,886,000	38.2	172,906	172,906	2.6	6,154,500	6,154,500	96.3	1,883,273	1,883,273	55.9
Illinois				246,300	123,150	2.3						
Indiana							65,700	42,391	.1	63,600	31,800	
Iowa												
Kentucky	250,000	125,000	2.6									
Louisiana				263,390	230,389	2.6	151,120	75,560	3.2			
Maine												
Michigan	200,000	200,000	10.8				695,000	695,000	11.0	410,917	271,476	25.7
Minnesota				731,972	683,570	27.2	63,494	63,494	4.7	349,379	346,979	16.2
Mississippi	460,500	230,250	12.7				650,347	628,347	9.9			
Missouri	70,000	35,000	7.7	776,361	442,143	41.2	95,846	95,846	4.7			
Montana	2,575,000	2,575,000	66.2	1,763,494	1,763,494	63.0	3,728,410	3,728,410	36.6	1,583,876	1,583,876	23.3
Nebraska	80,000	80,000	2.9									
Nevada	375,000	375,000	9.1	459,000	459,000	2.8	1,053,966	859,792	6.5	57,054	57,054	
New Hampshire	3,130	3,130	2.2	208,007	208,007	3.9	150,991	150,991	2.0	282,309	282,309	7.1
New Mexico	1,375,000	1,375,000	6.2	738,500	738,500	16.6	1,559,555	1,559,555	16.5	1,624,283	1,624,283	39.9

North Carolina	200,000	100,000	3.4				639,040	319,520	11.2			
North Dakota												
Ohio							62,234	62,234	1.4			
Oklahoma	63,700	63,700	4.5				28,800	28,800				
Oregon	4,513,000	4,313,000	54.8	175,139	175,139	7.9	7,534,375	7,534 375	89.4	4,242,734	4,242,734	57.5
Pennsylvania	200,000	100.000	2.1				214,000	107,000	1.7			
South Carolina	92,000	46.000	6.6	173,000	86,500	1.8	378,400	210,800	24.6	118,048	58,485	8.3
South Dakota	200,000	200,000	2.0	500	500		344,068	344,068	1.4	501,960	501,960	5.2
Tennessee										410,189	205,094	8.7
Texas	404,500	229,500	5.4	229,600	114,800	7.8	82,200	41,100	3.9	235,600	117,800	4.5
Utah	375,000	375,000	4.1	108,325	108,325		2,835.479	2,835,479	37.1	1,514,968	1,514,968	21.1
Vermont										114,723	114,723	1.6
Virginia	378,038	378.038	6.2	327,460	327.460	6.0	4,500	4,500		440,372	298,595	8.1
Washington	1,767.500	1.767,500	17.7	492,125	492,125	4.4	3,414,980	3,414,980	22.4	1,540,892	1,540,892	8.2
West Virginia							587,500	587,500	10.6			
Wisconsin							293,221	293,221	6.3	322.659	322,659	5.9
Wyoming	840,000	840,000	8.8	3.300	3.300		2,729,843	2,729,843	38.8	2,931,351	2,931,351	46.6
Puerto Rico							15,150	15,150				
Total	26,015,766	25,004,516	343.5	19,063.801	18,323.730	266.0	50,306,996	48,852.043	604.0	28,838,599	27,370.483	493.7

[1] Includes construction projects only. [2] Initial commitment of funds.

Table 18.—Mileage of the national forest highway system, by forest road class and by State, as of June 30, 1962

Region and State or Territory	Total	Class 1 [1]	Class 2 [2]	Class 3 [3]
WEST:				
Alaska	566.5	139.6	254.5	172.4
Arizona	1,051.7	327.5	653.0	71.2
California	2,536.7	1,065.7	913.3	557.7
Colorado	1,489.0	572.9	544.1	372.0
Idaho	1,229.3	659.6	452.7	117.0
Montana	1,215.1	678.3	257.4	279.4
Nevada	369.5	154.7	190.3	24.5
New Mexico	644.4	131.2	433.8	79.4
Oregon	1,473.5	681.5	729.3	62.7
South Dakota	296.6	184.5	101.1	11.0
Utah	732.1	224.2	270.8	237.1
Washington	766.8	480.5	238.4	47.9
Wyoming	562.4	344.4	135.5	82.5
Total	12,933.6	5,644.6	5,174.2	2,114.8
EAST:				
Alabama	374.4	82.3	276.8	15.3
Arkansas	655.6	96.1	559.5	
Florida	288.0	32.7	254.8	.5
Georgia	380.4	168.5	186.2	25.7
Illinois	306.2	241.3	45.7	19.2
Indiana	101.2	53.6	47.6	
Iowa	20.0	11.3	8.3	0.4
Kentucky	354.9	131.1	214.7	9.1
Louisiana	421.7	87.3	186.1	148.3
Maine	14.0			14.0
Michigan	1,166.0	590.4	557.8	17.8
Minnesota	704.0	311.8	365.4	26.8
Mississippi	578.9	323.9	255.0	
Missouri	1,053.6	370.7	676.7	6.2
Nebraska	23.5		23.5	
New Hampshire	159.3	61.9	41.0	56.4
North Carolina	834.1	217.6	569.9	46.6
Ohio	131.6	70.4	51.7	9.5
Oklahoma	81.8	45.1	36.7	
Pennsylvania	353.9	118.4	85.9	149.6
South Carolina	776.7	221.5	487.5	67.7
Tennessee	570.0	169.2	344.4	56.4
Texas	362.8	128.3	214.5	20.0
Vermont	111.5	30.5	57.8	23.2
Virginia	1,407.2	378.4	926.5	102.3
West Virginia	494.3	78.3	375.2	40.8
Wisconsin	467.5	75.7	391.8	
Puerto Rico	42.5		42.5	
Total	12,235.6	4,096.3	7,283.5	855.8
Grand total	25,169.2	9,740.9	12,457.7	2,970.6

[1] Forest roads which are on the Federal-aid primary system.
[2] Forest roads which are on the Federal-aid secondary system.
[3] Other forest highways.

For economy of space, table 19 is placed on page 83.

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